

Chapter 21

Relational Dialogue among Economic Theories

Theoretical Dialogue and Disciplinary Return

Chapter 21 opens Part VIII by returning Generative Relational Economics (GRE) to the wider theoretical ecology from which it emerged. Parts I–VII developed GRE progressively through historical reconstruction, disciplinary constitution, ontological and epistemological discipline, research and application praxis, substantive economic architecture, power and knowledge, artificial intelligence, domain translation, and economic-order synthesis. That sequence necessarily foregrounded GRE’s own conceptual vocabulary. The present chapter changes the direction of inquiry. Its task is to place GRE in sustained dialogue with economic traditions that organize economic reality through different objects, subjects, causal mechanisms, temporalities, value concepts, methods, and standards of evidence.

The chapter does not treat theoretical dialogue as a preliminary contest whose purpose is to identify one final winner. Economic traditions often illuminate different mechanisms, scales, historical formations, or dimensions of the same process. Some disagreements can be clarified through translation; some arise from different evidential regimes; some reflect distinct normative commitments; and some remain genuinely irreducible. A relational dialogue is useful when it makes these differences more precise while preserving the possibility that one theory may explain a local mechanism better than GRE. Theoretical plurality consequently becomes a source of correction as well as comparison.

This chapter also adopts a reflexive premise: economics itself has a history. The objects recognized as economic, the problems treated as central, the institutions through which research is organized, and the methods accepted as evidentially authoritative have changed over time. Classical political economy organized inquiry around wealth, production, distribution, class, accumulation, trade, and public revenue; marginalist and neoclassical traditions reformulated value and choice; twentieth-century formalization and econometrics altered the representational and evidential architecture of the field; institutional, historical, behavioral, feminist, ecological, complexity, capability, and relational traditions widened or redrew economic boundaries in other directions. These changes do not imply that economics

lacks an object. They indicate that the practical and disciplinary constitution of that object is historically mediated.

The chapter therefore proceeds in four movements. Sections 21.1–21.11 establish the comparative architecture. They examine economics as a relationally generated discipline, theories as relational configurations, a common but non-reductive vocabulary for dialogue, heterogeneous units of analysis and subjects, relations and structures, value and commensuration, scarcity and distribution, time and history, power and coordination, and evidential regimes. This movement supplies questions that can be asked across theories without assuming that the answers are equivalent.

Sections 21.12–21.24 then reconstruct major traditions through that comparative architecture. Classical political economy, neoclassical economics, Marxian political economy, Keynesian and Post-Keynesian economics, institutional and historical economics, behavioral and experimental economics, evolutionary and complexity economics, feminist and care economics, capability and human-development approaches, ecological economics, commons and solidarity traditions, economic sociology and relational economics, and digital or platform-centered analysis are examined for the mechanisms and objects they make visible. The aim is understanding and disciplined reconstruction. Each tradition should retain its own conceptual commitments and domain of adequacy before any GRE translation is attempted.

Sections 21.25–21.28 address translation directly. They distinguish conceptual, functional, structural, historical, scalar, and value-regime translation; develop several forms of equivalence without identity; preserve irreducible disagreement; and examine conditions for multi-theoretical explanation. The chapter therefore treats translation loss and non-equivalence as substantive outcomes rather than defects to be hidden.

The final movement, Sections 21.29–21.31, turns criticism back toward GRE. Existing theories may specify mechanisms more sharply, measure important phenomena more reliably, preserve historical specificity more effectively, or articulate normative distinctions that GRE currently handles only schematically. The chapter consequently asks what GRE should learn, where generative-relational translation overreaches, and which new research problems theoretical dialogue creates for Chapter 22.

Three restraints govern the chapter. First, a common relational vocabulary is an instrument of comparison, not evidence that every theory is secretly relational in the same sense. Second, explanatory usefulness remains local to claims, mechanisms, scales, and evidential settings. A theory that is limited in one domain may remain highly effective in another. Third, dialogue is reciprocal. GRE can reconstruct other theories only if it also permits those theories to revise GRE's objects, boundaries, formalizations, and normative assumptions.

Chapter 21 therefore treats economic theory as a plural and historically generated field of inquiry. Its purpose is neither synthesis by absorption nor eclectic combination without criteria. The aim is to construct a disciplined theoretical ecology in which comparison can reveal both correspondence and resistance. Section 21.1 begins that task by examining how economics itself is historically and relationally constituted as a discipline.

21.1 Economics as a Relationally Generated Discipline

The role of this section is to establish the reflexive starting point for Chapter 21: before economic theories are compared, the discipline within which those theories become intelligible should itself be treated as historically and relationally constituted. The objective is to explain how economic problems, categories, methods, evidential standards, institutions, and disciplinary boundaries are generated and stabilized without reducing economics to the sociology of economists or denying the reality of economic phenomena. The discussion proceeds through eight dimensions: historical formation, problem generation, disciplinary institutions, methods and evidential regimes, economic categories, disciplinary boundaries, boundary transformation, and the relational reality of economics. The method is historical, interpretive, and reflexive. It uses established episodes and disciplinary formulations as evidence of changing economic problem-spaces while preserving the distinction between changes in economic reality and changes in how economics represents that reality.

This reflexive stance matters for theoretical dialogue because theories do not enter comparison as timeless packages. A concept such as wealth, utility, capital, unemployment, capability, care, information, platform, or ecological constraint becomes analytically consequential within particular historical, institutional, and methodological arrangements. The same term can change meaning as its institutional carrier changes, while new economic conditions can make previously peripheral objects central to inquiry. Economics therefore requires both object-level analysis and a second-order account of how its objects become recognizable as economic. Table 21.1 summarizes the eight dimensions developed in this section.

Definition 21.1 (Relationally generated discipline). A *relationally generated discipline* is a history-bearing configuration of problems, categories, methods, evidential standards, institutions, research communities, professional practices, and boundary rules through which a field of inquiry stabilizes objects, produces warranted claims, reproduces expertise, and revises the conditions of its own inquiry.

The definition does not imply that a discipline constructs its object without constraint. Economic events, material processes, ecological conditions, institutions, prices, labor relations, technologies, and distributions can constrain economic claims regardless of prevailing disciplinary preference. The definition instead identifies the mediating architecture through which heterogeneous phenomena become recognized, measured, modeled, debated, and acted upon as economic.

Table 21.1 summarizes the dimensions through which this disciplinary configuration is historically generated and reproduced.

21.1.1 Historical Formation of Economic Inquiry

Economic inquiry has repeatedly reorganized its central objects. Smith's treatment of wealth connected division of labor, exchange, prices, wages, profits, rent, accumulation, trade, and public revenue within a broad political-economic problem-space (A. Smith 1776). Nineteenth-century marginalism redirected important parts of value theory toward marginal utility and exchange, while Marshall integrated demand, supply, production, distribution, exchange, and consumption within a reorganized ana-

Table 21.1: Dimensions through which economics is generated and reproduced as a discipline.

Dimension	Generative mechanism	Reflexive question
Historical formation	Changing production, institutions, political order, technologies, and intellectual lineages	Which historical conditions make particular economic objects and explanations salient?
Problem generation	Events, classifications, institutions, measurements, and practical contradictions	How does a condition become formulated as an economic problem?
Disciplinary institutions	Universities, journals, professional communities, statistical systems, public agencies, and research infrastructures	Which institutions reproduce categories, methods, standards, and research agendas?
Methods and evidence	Formal models, statistics, econometrics, experiments, history, institutional analysis, qualitative inquiry, and computation	Which manifestations of economic reality become legible through each evidential regime?
Economic categories	Concepts, classifications, units, indicators, and institutional representations	Which relations become visible or compressed when an economic category stabilizes?
Disciplinary boundaries	Conventions governing what is treated as economically relevant	Which objects enter economic inquiry, and which remain delegated to neighboring disciplines?
Boundary transformation	New technologies, institutions, crises, social movements, and cross-disciplinary borrowing	How do new phenomena or methods alter the practical scope of economics?
Relational reality	Persistent networks of concepts, institutions, practices, records, and authority	How does economics become causally consequential while remaining historically revisable?

lytical architecture (Jevons 1871; Marshall 1890). Robbins later offered an influential disciplinary formulation centered on scarce means with alternative uses, thereby giving scarcity a constitutive role in defining the field (Robbins 1932). Samuelson's formal synthesis further consolidated maximizing behavior, equilibrium systems, comparative statics, production, and welfare analysis within a common mathematical framework (Samuelson 1947).

These developments matter here as evidence of disciplinary transformation, not as a linear progression toward one correct definition of economics. Classical political economy, marginalism, neoclassical theory, institutional economics, Keynesian traditions, Marxian political economy, feminist economics, ecological economics, capability approaches, behavioral research, complexity economics, and economic sociology retain different objects and explanatory priorities. The historical field therefore contains branching lineages, partial inheritances, reformulations, and persistent disagreements.

The economic world also changes alongside the discipline. Industrial organization, corporate forms, monetary institutions, welfare systems, mass statistics, global production networks, digital platforms, data infrastructures, ecological constraints, and artificial intelligence create relations whose economic significance cannot be inferred solely from older categories. A discipline can therefore face two distinct historical problems at once: inherited theories may remain useful within their domains, while new configurations generate objects that require different combinations of concepts and methods.

Polanyi's historical treatment of market society provides one influential example of this reflexive relation between economic categories and institutional formation

(Polanyi 1944). His later formulation of the economy as an instituted process likewise emphasizes that reciprocity, redistribution, and exchange operate through historically constituted institutional arrangements rather than through one invariant organizational form (Polanyi 1957). GRE does not adopt Polanyi's framework as a complete definition of economics. It takes from this lineage the discipline of asking which institutional relations make a particular economic category historically operative.

Proposition 21.2 (Historical-formation condition for economic inquiry). *An account of economics as a discipline is historically adequate only where changes in its central problems, categories, methods, and boundaries are interpreted together with changes in the economic institutions and material relations that make those transformations intelligible.*

The proposition prevents two reductions. Intellectual history alone cannot explain every disciplinary transformation, because changes in production, institutions, technology, and political order alter the problems presented to inquiry. Social change alone cannot explain theoretical development either, because concepts, methods, schools, and research institutions mediate how such changes become economically intelligible.

21.1.2 Historical Generation of Economic Problems

An economic condition becomes a disciplinary problem through processes of selection, representation, and institutional attention. Material hardship can exist before a statistical category stabilizes it; unpaid care can sustain production while remaining weakly represented in national accounting; information can become economically consequential before theories specify its unusual production and appropriation properties; platform dependence can become widespread before standard firm or market categories represent its architecture adequately. Economic problems therefore have both object-level existence and problem-form histories.

This distinction does not imply that problems are arbitrary constructions. The absence of a category can obscure a real burden, while the creation of a category can improve observation without creating the underlying condition. The relevant analytical question is how a dispersed set of events, relations, experiences, measurements, and institutional demands becomes organized into a problem that supports research and intervention.

Kuhn's account of normal science is useful at this level because it emphasizes that research communities do not choose puzzles from an unconstrained universe; problems become salient within historically organized fields of concepts, exemplars, and standards (Kuhn 1962). The analogy should remain bounded. Economics contains multiple traditions rather than one unified paradigm, and practical economic crises can force questions into the field that established theories initially represent poorly. Still, the broader discipline is valuable: problem selection is structured.

GRE adds a generative question to this process. A problem-form does more than describe a condition. It can influence what data are collected, which populations become visible, what causal mechanisms are investigated, which interventions are considered, and which future capacities are funded. Defining unemployment, pro-

ductivity, inflation, poverty, human capital, market concentration, unpaid care, systemic risk, digital access, or ecological damage in one way rather than another can redirect institutional attention and resources even when the definition is introduced for analytical purposes.

Definition 21.3 (Economic problem-form). An *economic problem-form* is a historically situated representation that organizes selected economic conditions, affected positions, mechanisms, evidence, boundaries, and intervention possibilities into a researchable or governable object.

A problem-form can be more or less adequate to the relations it represents. It can also coexist with rival formulations. The discipline therefore benefits from preserving the lineage of problem definitions rather than allowing the currently dominant formulation to appear natural or inevitable.

21.1.3 Disciplinary Institutions and Knowledge Reproduction

Economic knowledge is reproduced through institutions. Universities train researchers; journals and publishers stabilize channels of evaluation and dissemination; professional communities reproduce vocabularies and standards; statistical agencies and public institutions construct recurring data infrastructures; central banks, ministries, firms, international organizations, research institutes, and civil-society organizations generate problems, records, and forms of expertise. These institutions differ in purpose and authority, yet together they influence which forms of economic knowledge remain available for cumulative inquiry.

The institutional relation has two directions. Research institutions shape economics by allocating time, training, funding, publication opportunities, data access, and professional recognition. Economics also shapes institutions by supplying categories, forecasts, metrics, policy evaluations, and organizational representations that can alter practical decision making. The discipline is therefore neither external observer nor simple instrument of institutional interests. It occupies multiple positions inside the economic field it studies.

Institutional reproduction also creates path dependence. A method can remain influential partly because training, software, datasets, publication conventions, and accumulated expertise make it inexpensive to reuse. A neglected method can become difficult to employ because the required archives, languages, field networks, or professional skills deteriorate. Institutional history consequently shapes not only what researchers prefer but what forms of inquiry remain practically feasible.

This point connects Chapter 17's epistemic economy to disciplinary self-analysis. Economic inquiry depends on preservation, provenance, verification, interpretation, mentoring, criticism, and research infrastructure. A discipline can expand its output while weakening its capacity to reproduce some of the skills required to interpret older evidence, maintain long-run datasets, conduct difficult fieldwork, or reconstruct theories outside current methodological conventions.

Proposition 21.4 (Disciplinary-reproduction condition). A *disciplinary account of economics* should include the institutional conditions through which economic questions, methods, records, expertise, criticism, and professional standing are reproduced,

because those conditions affect which economic realities remain practically researchable.

The proposition does not make institutional explanation sufficient for evaluating a theory. A model remains answerable to its assumptions, logic, evidence, and explanatory performance. Institutional analysis adds a second question: which relations made the production, persistence, and correction of that model possible?

21.1.4 Methods and Evidential Regimes

Economics contains multiple evidential regimes. Formal theory can isolate logical implications under explicit assumptions; econometrics can identify or estimate relationships under specified designs; experiments can investigate behavior under controlled or quasi-controlled conditions; historical inquiry can reconstruct sequences and institutional transformation; institutional analysis can study rules, positions, and governance arrangements; qualitative and ethnographic approaches can recover meanings, tacit practices, and mechanisms that standardized datasets represent weakly; computational models can explore interacting heterogeneous agents or complex dynamics.

These methods disclose different manifestations of economic reality. Samuelson's formal programme illustrates the power of mathematical unification for deriving implications across several domains of economic analysis (Samuelson 1947). Contemporary causal econometrics, by contrast, places strong emphasis on research designs that support identification of causal effects from observed variation (Angrist and Pischke 2009). Institutional research such as Ostrom's work on governance demonstrates the importance of rules, participant positions, local knowledge, and institutional diversity for problems that resist a simple market-versus-state representation (Ostrom 1990; Ostrom 2005).

A relational account of disciplinary method does not require methodological relativism. Methods can be inappropriate to a target, poorly executed, underidentified, formally inconsistent, historically insensitive, or normatively confused. The point is that methodological adequacy is indexed to the claim being made. A randomized design may identify a local treatment effect while saying little about historical emergence; an archive may reconstruct institutional sequence without identifying a general causal magnitude; an equilibrium model may clarify compatibility conditions without establishing the stability of a real economy; an ethnography may reveal a mechanism whose prevalence remains quantitatively uncertain.

Theoretical dialogue therefore requires evidential translation as well as conceptual translation. Disagreement can arise because two traditions ask different questions of different evidence. Before treating one conclusion as a contradiction of another, the analyst should ask whether the claims share an object, population, temporal scale, mechanism, and evidential burden.

Definition 21.5 (Disciplinary evidential regime). *A disciplinary evidential regime is a structured relation among research questions, admissible evidence, methods of inference, standards of justification, representational practices, and communities of criticism through which a class of economic claims acquires or loses warrant.*

This definition will matter later in Section 21.11, where methodological translation across theories becomes a direct object of analysis.

21.1.5 Economic Categories and Analytical Visibility

Economic categories perform two connected functions. They compress heterogeneous relations into tractable analytical objects, and they make some relations visible enough for measurement, comparison, law, administration, or theory. Categories such as household, firm, worker, capital, property, unemployment, income, productivity, human capital, market, public good, platform, or capability can therefore be both epistemic representations and institutionally consequential classifications.

Compression is necessary. Research cannot represent every relation simultaneously. A firm boundary supports accounting and legal responsibility; a household category supports demographic and income analysis; an employment category makes labor-force statistics possible. Yet the category can conceal relations outside its boundary. Productive capacity attributed to a firm may depend on public infrastructure, unpaid care, supplier knowledge, ecological conditions, and social trust. Household income can conceal unequal control within the household. Employment statistics can omit economically consequential unpaid work. A category gains analytical power by selecting, and selection always has a remainder.

Several economic traditions have expanded visibility by altering category systems. Human-capital analysis represented education and training as investments in productive capacity (Becker 1964). Capability approaches shifted evaluative attention from commodities and utility toward what persons are substantively able to do or be (Sen 1985). Economic sociology emphasized that economic action is embedded in ongoing social relations, challenging strongly atomized representations (Granovetter 1985). Feminist economic work made care, unpaid labor, and social provisioning more visible as economically consequential processes. These moves differ substantially, yet each demonstrates that disciplinary categories help determine which relations enter economic explanation.

GRE consequently treats categories as revisable interfaces between economic reality and economic inquiry. Revision is warranted when an inherited category ceases to preserve mechanisms material to the question, when new institutions alter its constitutive relations, or when excluded positions become necessary to explanation. Category expansion should remain disciplined, because making every social phenomenon economic would dissolve the field's explanatory boundaries.

Proposition 21.6 (Category-visibility condition). *An economic category is analytically adequate only relative to the relations it is intended to preserve, the relations it compresses, and the claim for which that compression is being used.*

This condition allows economics to use operational categories without mistaking them for exhaustive ontologies of the entities they represent.

21.1.6 Disciplinary Boundaries of Economics

The boundary of economics has never been given by one permanent object definition. Smith's inquiry into wealth included production, exchange, distribution, pub-

lic finance, institutional arrangements, and moral-political questions associated with commercial society (A. Smith 1776). Robbins's scarcity formulation provided a much more formal boundary centered on the relation between ends and scarce means with alternative uses (Robbins 1932). Later economic work has analyzed education, information, institutions, households, health, environment, networks, platforms, and other objects that complicate any simple substantive boundary.

Boundary expansion can occur through at least four pathways. First, a previously external condition can become recognized as causally necessary to economic explanation. Second, a new institution or technology can create economically consequential relations that inherited categories represent weakly. Third, a method can make a previously inaccessible object measurable or formally tractable. Fourth, normative or political contestation can expose omitted burdens, forms of labor, affected positions, or ecological dependencies.

Yet disciplinary openness requires containment. GRE already adopted this discipline in Chapters 3 and 20: legal, psychological, ecological, political, cultural, or ethical questions can intersect economic inquiry without becoming reducible to economics. An economic analysis of legal standing examines how legal categories affect access, obligation, property, labor, or capability; it does not replace jurisprudence. An economic analysis of care can examine time, capability, dependence, and social reproduction while leaving dimensions of intimacy or moral relation to other forms of inquiry.

Definition 21.7 (Economic disciplinary-boundary profile). An *economic disciplinary-boundary profile* specifies the objects treated as economically consequential for a given inquiry, the relations through which that consequence is established, the neighboring domains required for adequate interpretation, and the remainder that should remain outside economic reduction.

This profile makes disciplinary boundaries claim-relative without making them arbitrary. The relevant question is whether including or excluding an object materially changes economic explanation, evaluation, or intervention.

21.1.7 Boundary Transformation and New Economic Objects

Disciplinary boundaries transform when economic reality creates new interfaces among previously separated categories. Information provides an instructive example. Arrow's analysis of invention emphasized uncertainty and appropriation problems that distinguish knowledge production from ordinary commodity production (Arrow 1962). Digital platforms later coupled information, matching, ranking, attention, reputation, data extraction, labor, and infrastructure control inside organizational forms that cannot be represented fully through a simple seller-buyer transaction. Artificial intelligence further couples productive capability with epistemic infrastructure, symbolic generation, delegation, verification, and organizational dependence.

Similar transformations occur outside digital economies. Care economics reveals relations through which households, employment, public services, embodiment, and social reproduction interact. Ecological economics makes material and energetic dependence visible where conventional monetary boundaries can externalize biophys-

ical change. Migration connects labor markets, legal status, households, care, remittances, and multiple jurisdictions. Knowledge economies connect research institutions, intellectual property, public funding, firms, education, and information infrastructures.

A new economic object therefore need not be a newly existing entity. It can be a newly consequential relation, a newly measurable process, or a configuration whose economic effects become too large to remain analytically peripheral. Boundary transformation can also move in the opposite direction: a category may lose usefulness when its historical mechanism disappears or becomes better represented through a different framework.

This process creates a reflexive danger. Once a discipline acquires an expanding vocabulary, it can redescribe almost any phenomenon as economic. Chapter 20's validity-boundary discipline therefore carries directly into the present chapter. Expansion is warranted only where the economic mechanism, evidence, and explanatory gain can be stated. A relational language should enlarge analytical reach where necessary while preserving neighboring domains and domain-specific remainders.

Proposition 21.8 (Boundary-transformation condition). *A transformation of economics' disciplinary boundary is warranted where changed economic relations, institutions, technologies, or evidential capacities create an object whose inclusion materially improves economic explanation, while the object's non-economic dimensions and disciplinary remainders remain explicit.*

This proposition will later constrain GRE's dialogue with established traditions. A concept should enter the common comparative language because it performs identifiable analytical work, not because GRE can relabel it relationally.

21.1.8 Economics as Relational Reality

The preceding analysis supports a final distinction between economics as an intellectual abstraction and economics as a relationally real discipline. Economics has persistent institutions, publications, classifications, educational pathways, professional roles, datasets, policy interfaces, models, and public authority. These structures can shape investment, regulation, measurement, organizational behavior, and public interpretation. They therefore possess causal efficacy within the social world even though their boundaries, categories, and internal standards remain historically revisable.

This is the sense in which economics can be treated as a *relational reality*. The claim does not assert that "economics" is a single entity with one intention, nor that disciplinary consensus exists. It identifies a sufficiently persistent configuration of relations through which heterogeneous economic inquiries are reproduced, recognized, criticized, and made consequential. Competing schools can inhabit the same disciplinary field while disagreeing about its central objects and methods.

The relational-reality formulation also makes reflexivity tractable. Economic theories can influence the economic systems they describe through policy, organizational design, measurement, expectations, professional training, and institutional categories. Merton's self-fulfilling-prophecy mechanism provides a general social-

theoretical example of how socially consequential definitions can contribute to producing the conditions they anticipate (Merton 1948). GRE should use such mechanisms selectively rather than infer that every economic representation is performative. Still, the possibility matters: the discipline can enter the causal field of its own objects.

Definition 21.9 (Disciplinary relational reality). A *disciplinary relational reality* is a sufficiently persistent and causally consequential configuration of concepts, institutions, communities, records, methods, classifications, and practices through which a field of inquiry is reproduced and through which its representations can affect the domain it studies.

Economics therefore occupies two positions simultaneously. It studies historically changing economic realities, and it participates in institutions through which some of those realities are classified, measured, governed, and transformed. The relation does not erase the distinction between theory and world. It makes that distinction historically mediated and empirically researchable.

Proposition 21.10 (Disciplinary-reflexivity condition). *Economic theory should be treated as reflexively consequential where its classifications, models, measurements, or institutional uses materially alter the behavior, rules, expectations, or resource flows of the economic configuration being studied.*

The proposition establishes the bridge to Section 21.2. If economics is itself a relationally generated and occasionally causally operative discipline, then individual economic theories can be examined as relational configurations connected to historical contexts, research communities, institutional locations, methods, and manifestations. That analysis does not relativize theoretical truth. It adds the conditions under which theoretical claims are produced, sustained, challenged, and revised to the comparative architecture of Chapter 21.

21.2 Economic Theories as Relational Configurations

The role of this section is to establish the unit through which Chapter 21 will compare economic theories. The objective is to treat a theory neither as an isolated set of propositions nor as a mere expression of its social environment, but as a history-bearing configuration connecting analytical objects, observer positions, research communities, institutional locations, methods, evidential access, representations, and revision practices. The discussion proceeds through eight dimensions: theory–object–observer configuration, historical context, research-community reproduction, institutional location, method–theory coupling, manifestational access, generative effects, and theoretical revisability. The method is reflexive and comparative. It preserves the logical and evidential content of theories while adding the conditions through which their objects become visible, their claims become reproducible, and their categories become economically consequential.

This approach extends the disciplinary analysis in Section 21.1. Economics can contain multiple theoretical configurations at the same time because shared disciplinary institutions do not require one object, one method, or one explanatory ontology. A general-equilibrium model, a historical account of accumulation, a capability analy-

Table 21.2: Dimensions of an economic theory treated as a relational configuration.

Dimension	Relational object	Comparative risk
Object–observer	Objects selected together with positions from which they are represented	Treating object selection as neutral or purely subjective
Historical context	Problems, institutions, technologies, and events conditioning theoretical formation	Projecting historically specific categories across unlike contexts
Research community	Shared concepts, training, criticism, publication, and reproduction practices	Equating community reproduction with theoretical validity
Institutional location	Universities, states, firms, international organizations, foundations, professional bodies, and other carriers	Ignoring how access, incentives, and authority shape feasible inquiry
Method–theory coupling	Methods through which theoretical objects become tractable and claims become testable	Treating one method as the theory’s complete object
Manifestational access	Observations, measurements, models, narratives, cases, and traces through which objects appear	Treating representation as exhaustive access to the economic object
Generative effects	Effects of theory on classification, policy, organization, measurement, expectations, and design	Inferring performativity from intellectual influence alone
Revisability	Procedures through which concepts, assumptions, scope, and claims are altered or withdrawn	Preserving a theory by absorbing every counterexample into elastic reinterpretation

sis, a care-economy reconstruction, and an institutional study can inhabit the same disciplinary field while selecting different units, causal relations, manifestations, and evidential standards. Their coexistence therefore cannot be understood adequately by listing doctrines alone. Comparison requires a representation of the configuration within which a theoretical claim acquires meaning and warrant.

Definition 21.11 (Economic theoretical configuration). An *economic theoretical configuration* is a history-bearing arrangement of analytical objects, observer positions, concepts, assumptions, methods, evidential interfaces, research communities, institutional locations, representations, and revision practices through which a body of economic claims is formulated, evaluated, reproduced, and made consequential.

The definition is intentionally broader than a formal model and narrower than the discipline as a whole. A theoretical configuration can include mathematical models, verbal mechanisms, historical interpretations, classificatory systems, measurement conventions, and practical institutional uses. It can also contain internal disagreement. The relevant condition is sufficient coherence for claims, objects, methods, and evidential practices to remain mutually intelligible over some period.

Table 21.2 summarizes the eight dimensions developed below.

21.2.1 Theory–Object–Observer Configuration

Economic theories begin by differentiating an object-space. A theory may foreground individual choice, production relations, institutions, capabilities, aggregate demand, care, ecological throughput, networks, or innovation. Such selection does not mean that excluded relations cease to exist. It defines which distinctions become analytically operative and which are temporarily compressed. The observer enters this process through the questions posed, categories used, scales selected, and manifestations treated as evidentially accessible.

The term *observer* here is broader than an individual researcher. It can denote a modeling position, measurement regime, institutional role, disciplinary tradition, policy vantage point, or historically available problem-form. A national statistical office and a household ethnography can observe the same economy through different classificatory infrastructures. A firm-level productivity study and a social-reproduction analysis can share empirical events while constructing different units and relations as analytically central.

Definition 21.12 (Theory–object–observer profile). *A theory–object–observer profile specifies the economic objects selected by a theory, the relations through which those objects are constituted, the observer positions from which they become representable, the scales and boundaries of observation, and the consequential exclusions introduced by that configuration.*

The profile avoids two opposite reductions. Object selection is not arbitrary, because economic conditions can resist inadequate representation and generate counterevidence. Observer position is also not eliminable, because data categories, model boundaries, units of analysis, and research questions mediate what can be claimed. The relational problem is therefore to specify how object and observer are connected without collapsing one into the other.

A theory of unemployment, for example, can define its object through labor-market status, aggregate demand, search frictions, institutional classifications, household constraints, or combinations of these. Each representation permits different questions and can support different interventions. Their difference cannot be adjudicated solely by asking which vocabulary is more comprehensive. Adequacy depends on the target claim, mechanism, evidence, and scale.

Proposition 21.13 (Object-selection condition). *Comparison among economic theories requires the objects, observer positions, scales, and excluded relations relevant to each theory to be specified before substantive claims are treated as directly commensurable.*

This condition will matter throughout the chapter. The same word can refer to different configured objects, while different words can sometimes refer to partially corresponding structures. A relational comparison must therefore precede any assertion of theoretical equivalence.

21.2.2 Historical Context of Theoretical Formation

Theoretical configurations form within historical problem-spaces. Industrialization, financial crises, mass unemployment, welfare-state development, decolonization, globalization, ecological degradation, digital platforms, and artificial intelligence can alter both economic reality and the questions that appear urgent or tractable. A theory can therefore be historically situated without its claims being reducible to historical circumstance.

Classical political economy developed around problems of production, distribution, trade, accumulation, and class formation in historically changing commercial and industrial societies. Marginal and neoclassical frameworks reorganized important parts of economic analysis around choice, exchange, scarcity, and equilibrium.

Keynesian traditions made aggregate instability, money, expectations, and unemployment central under conditions in which coordination through price adjustment alone appeared analytically insufficient. Later institutional, capability, behavioral, ecological, care, complexity, and platform-centered approaches responded to different empirical and theoretical problem-spaces. These lineages overlap, contest, and recombine rather than succeeding one another in a single sequence.

Kuhn's analysis of scientific communities provides one influential language for examining how problem selection, exemplars, and disciplinary standards can stabilize historically (Kuhn 1962). The present argument uses this insight cautiously. Economics contains persistent pluralism, methodological diversity, and institutional heterogeneity, so its theoretical configurations need not fit one paradigm structure. Historical context is better treated as a conditioning relation whose relevance must be established for the theory under examination.

Definition 21.14 (Theoretical historical-context profile). A *theoretical historical-context profile* records the economic conditions, institutional structures, technologies, political problems, intellectual inheritances, available evidence, and practical controversies materially connected to the formation or transformation of a theoretical configuration.

The profile also supports historical transfer discipline. A theory developed for one institutional order may travel successfully to another, but the warrant for transfer depends on the persistence of relevant mechanisms and semantics. Historical origin alone neither validates nor invalidates later use.

Proposition 21.15 (Historical-context condition). *Historical explanation of a theory becomes analytically relevant where changes in economic conditions, institutional arrangements, available evidence, or problem-forms help explain the theory's object selection, assumptions, scope, or revision without substituting genealogy for evaluation of the theory's claims.*

This distinction permits Chapter 21 to place theories historically while still asking whether their mechanisms, formalizations, and empirical implications remain adequate beyond their contexts of formation.

21.2.3 Research-Community Reproduction of Theory

A theoretical configuration persists through communities capable of reproducing its language and standards. Textbooks, graduate training, seminars, journals, conferences, replication practices, data infrastructures, citation networks, professional associations, and informal intellectual lineages transmit what counts as a recognized problem, acceptable proof, convincing evidence, or technically competent contribution.

Research-community reproduction is analytically distinct from consensus. Communities contain disputes over assumptions, identification strategies, formal techniques, evidence, normative premises, and scope. A community can preserve a shared theoretical vocabulary precisely through structured disagreement over its use. Conversely, a theory can diffuse across several communities that reinterpret it differently.

Definition 21.16 (Theoretical reproduction profile). A *theoretical reproduction profile* specifies the training, communication, criticism, publication, data, replication, and succession relations through which a theoretical configuration remains intelligible and capable of cumulative development across researchers and generations.

This profile makes tacit knowledge visible. Competence in a theory often requires more than possession of its published propositions. Researchers learn how to simplify, which anomalies to treat as important, which approximations are acceptable, how to diagnose a failed model, and which empirical designs carry evidential weight. Such practical knowledge is part of theoretical reproduction even when it is weakly codified.

The existence of a strong research community does not establish truth. Community reproduction can stabilize fruitful knowledge, but it can also reproduce blind spots, inaccessible technical conventions, path dependence, or narrow problem selection. The proper analytical relation is therefore reflexive rather than dismissive.

Proposition 21.17 (Research-community condition). *Theoretical persistence should be analyzed through the community relations that reproduce competence and criticism while theoretical adequacy remains separately accountable to argument, evidence, rival explanation, and domain performance.*

This separation will be important when established schools are reconstructed later in the chapter. Their institutional persistence is neither evidence against them nor sufficient evidence for them.

21.2.4 Institutional Location of Theoretical Production

Economic theory is produced within institutions that provide resources, permissions, incentives, data access, career structures, practical problems, and channels of application. Universities, central banks, statistical agencies, governments, international organizations, firms, foundations, research institutes, professional associations, and civil-society organizations can occupy different positions in this theoretical field.

Institutional location affects feasible inquiry through access to time, computation, administrative records, field sites, proprietary data, policy processes, and professional networks. It can also shape which problems carry practical urgency. Central-bank research may develop especially detailed representations of monetary transmission or financial stability; development organizations can generate categories centered on poverty, capability, institutions, or programme evaluation; firms may possess high-resolution operational data unavailable to public researchers.

These relations should not be converted into simple claims of institutional bias. Institutional location can generate distinctive knowledge as well as distinctive blind spots. The relevant analytical question is which dependencies, accesses, incentives, and authority relations condition the theory's production and use.

Definition 21.18 (Institutional-location profile). A *theoretical institutional-location profile* records the institutions that materially support, constrain, apply, or authorize a theoretical configuration together with relevant resource access, data access, professional incentives, dependencies, practical responsibilities, and channels of public or organizational influence.

Institutional use can also alter the theory itself. A concept adopted into regulation, accounting, welfare administration, organizational design, or statistical classification may acquire operational definitions and data infrastructures that feed back into research. Theory, institution, and measurement can therefore become historically coupled.

Proposition 21.19 (Institutional-location condition). *Institutional location is theoretically consequential where it materially shapes feasible evidence, object definition, research incentives, channels of implementation, or feedback from practical use into subsequent theoretical development.*

The proposition remains narrower than a sociology of knowledge claim about all theoretical content. It specifies a mechanism that can be investigated rather than presumed.

21.2.5 Method–Theory Coupling

Economic theories and methods often co-develop. Formal optimization can make preference and constraint structures precise; econometrics can connect theoretical mechanisms to statistical variation; experiments can isolate local behavioral responses; historical analysis can reconstruct institutional transformation; ethnography can reveal tacit practices and categories; simulations can explore interaction among heterogeneous agents; network methods can represent relational position and propagation.

A method does more than test a pre-existing theory when its representational affordances make some theoretical objects easier to formulate. Samuelson’s formal synthesis illustrates how mathematical representation can reorganize the architecture of theoretical economics rather than merely restate it (Samuelson 1947). Similar relations occur when new datasets, computing capacities, experiments, or measurement systems make previously weakly tractable objects available to inquiry.

Method–theory coupling can generate blind spots when the feasible method becomes mistaken for the complete object. A phenomenon difficult to quantify can be economically consequential; a formally tractable mechanism can be empirically minor; a rich historical reconstruction can lack identification for a specific causal claim. Methodological pluralism therefore requires local adequacy rather than indiscriminate accumulation of methods.

Definition 21.20 (Method–theory coupling profile). *A method–theory coupling profile specifies how a theory’s objects, assumptions, mechanisms, and evidential claims are enabled, transformed, constrained, or tested by the methods through which the theory is developed and evaluated.*

Proposition 21.21 (Method–theory adequacy condition). *Methodological comparison among theories should distinguish the objects made tractable by a method from the broader economic object, and should evaluate method adequacy relative to the local claim, mechanism, scale, and evidential requirement.*

This condition prevents methodological translation from becoming a hierarchy in which one evidential regime automatically absorbs the others.

21.2.6 Manifestational Access in Theoretical Representation

Economic theories encounter their objects through manifestations. Prices, quantities, transactions, surveys, administrative records, balance sheets, interviews, institutional texts, experiments, historical archives, network traces, and observed practices provide partial access to economic relations. The same underlying configuration can generate different manifestations at different scales or through different institutional interfaces.

GRE's distinction between relational and manifestational reality is useful here because it prevents evidence from being equated with the total object. A wage record manifests one part of a labor relation; it does not by itself represent bargaining, care obligations, professional identity, tacit knowledge, workplace power, or household conversion. A market price can convey scarcity and exchange conditions while remaining incomplete for ecological degradation or unpaid care. An aggregate indicator can track consequential change while compressing distributional heterogeneity.

Definition 21.22 (Theoretical manifestation profile). *A theoretical manifestation profile identifies the observable or reconstructable traces through which a theory accesses its object, the transformations connecting those traces to theoretical categories, and the relevant relations that remain latent, compressed, or inaccessible within that representation.*

The profile creates a common language for comparing theories that use unlike evidence. One theory can rely on aggregate time series, another on institutional records, and another on qualitative reconstruction. Their evidence cannot be made equivalent merely by translating vocabulary. Comparison requires attention to what each manifestation can warrant.

Proposition 21.23 (Manifestational-adequacy condition). *A theoretical representation is evidentially adequate relative to a claim where the manifestation through which the object is accessed preserves the relations required for that claim and where material latent or compressed relations remain explicit in the stated scope.*

The condition also clarifies disagreement. Two theories can conflict because they make incompatible claims about the same manifestation, because they explain different manifestations of one configuration, or because they construct different objects from partially overlapping evidence.

21.2.7 Generative Effects of Economic Theory

Economic theory can become part of the economic configurations it describes. Concepts can enter policy rules, organizational routines, accounting systems, market design, measurement conventions, professional education, expectations, and public reasoning. Their use can alter incentives, classifications, institutions, or resource flows, creating a reflexive relation between theoretical representation and economic reality.

Merton's analysis of self-fulfilling processes provides one general mechanism through which socially consequential expectations can contribute to the conditions they anticipate (Merton 1948). Economic theory can enter similar processes through more specific institutional pathways. A regulatory model can change reporting

behavior; a performance metric can reorganize organizational priorities; a market-design theory can be instantiated in an actual allocation mechanism; a statistical classification can determine eligibility or visibility.

The present argument therefore uses *generative effect* in a bounded sense. Intellectual influence alone is insufficient. A theoretical configuration becomes economically generative when identifiable transmission mechanisms connect its representation to changed rules, expectations, infrastructures, practices, categories, or capabilities.

Definition 21.24 (Theoretical generativity profile). *A theoretical generativity profile specifies the institutional, organizational, educational, classificatory, technological, or policy pathways through which an economic theory contributes to changing the economic configuration that it subsequently observes or evaluates.*

These effects can strengthen or weaken the theory's later empirical fit. A theory instantiated through policy can create conditions closer to its modeled assumptions. It can also produce unforeseen responses that expose missing relations. Reflexivity therefore does not protect a theory from criticism. It creates additional causal pathways that require analysis.

Proposition 21.25 (Theory-generativity condition). *An economic theory should be treated as a generative object where identifiable transmission pathways connect its concepts, models, classifications, or recommendations to later changes in economic behavior, institutions, measurements, capabilities, or resource flows.*

The proposition also constrains claims of performativity. A theory can remain descriptively influential without becoming causally decisive, and economic actors can appropriate theoretical categories in heterogeneous or resistant ways.

21.2.8 Theoretical Revisability across Configuration Change

Treating theories as relational configurations makes theoretical revision more precise. A theory can change through alteration of concepts, assumptions, model closure, measurement, method, institutional location, empirical scope, normative premises, or problem definition. Several of these can change while the theory retains enough continuity to remain recognizable; sufficiently extensive change can instead produce a successor configuration.

Revision should therefore be recorded at the level at which it occurs. A revised parameter estimate is different from a changed causal mechanism. Extension to a new domain is different from semantic redefinition. Addition of an auxiliary condition is different from decomposition of an earlier theoretical object. A research programme becomes difficult to criticize when every adverse result can be redescribed as already compatible with its core language.

Definition 21.26 (Theoretical configuration revision record). *A theoretical configuration revision record preserves changes in a theory's objects, semantics, assumptions, methods, evidential base, formalization, institutional uses, empirical scope, rival explanations, boundary conditions, and unresolved remainder together with the reasons for those changes.*

This record parallels the claim-version discipline developed for GRE in Chapter 20. It also supports fair historical comparison. A contemporary theory should not be

attributed unchanged to an earlier formulation when later researchers have altered its semantics or evidential architecture. Conversely, an earlier criticism may remain relevant if the mechanism it identifies persists beneath revised vocabulary.

Proposition 21.27 (Theoretical-revisability condition). *A theoretical configuration remains cumulatively revisable where empirical failure, formal inconsistency, rival explanation, historical change, domain transfer, and methodological criticism can produce identifiable narrowing, decomposition, reinterpretation, replacement, or withdrawal of claims rather than only expansion of protective auxiliary language.*

The eight dimensions developed in this section establish the unit of theoretical dialogue used in the remainder of Chapter 21. A theory enters comparison as a configured relation among object, observer, history, community, institution, method, manifestation, generative effect, and revision pathway. This representation preserves both theoretical content and the conditions through which that content becomes intelligible and consequential.

Section 21.3 now develops the next layer of the dialogue: a common relational vocabulary for objects, subjects, relations, resources, capacities, constraints, value, history, power, evidence, method, and generativity. That vocabulary can support comparison only if the configuration-specific meanings established here remain visible. Relational translation will therefore function as an interface among theories rather than as a procedure for dissolving their differences.

21.3 Common Relational Coordinates for Theoretical Dialogue

The role of this section is to establish a common language through which heterogeneous economic theories can be compared without being treated as semantically or structurally identical. The objective is not to replace the vocabulary of classical, neo-classical, Marxian, Keynesian, institutional, behavioral, capability, feminist, ecological, complexity, commons, relational, or digital-economic traditions. It is to define a set of *comparison coordinates* that can record what each theoretical configuration treats as an object, subject, relation, resource, capacity, constraint, value, historical process, power relation, evidential warrant, and generative effect. The section proceeds through eleven such coordinates. Its method is explicitly non-reductive: each coordinate is a question posed to a theory, not a claim that the theory already contains the GRE concept in the same sense.

Section 21.2 established that economic theories enter dialogue as history-bearing configurations rather than isolated propositions. A common vocabulary is useful only after those configuration-specific meanings remain visible. Otherwise translation can create false equivalence: a “resource” in one theory can be a produced input, a legal entitlement, a capability-enabling condition, an ecological stock, or a socially recognized asset; a “subject” can be a preference bearer, class-positioned agent, household member, institutional actor, collective, or artificial system. Similar words can therefore mask different theoretical objects, while unlike words can sometimes denote partially corresponding structures.

Definition 21.28 (Relational dialogue coordinate system). *A relational dialogue co-*

Table 21.3: Common relational coordinates for non-reductive dialogue among economic theories.

Coordinate	Comparative question	Reduction risk
Objects	What entities, processes, configurations, or units are made analytically primary?	Treating unlike units as instances of one universal object
Subjects	Which positions can act, choose, experience, contribute, represent, or be affected?	Equating agency, standing, preference, and subjecthood
Relations	Which exchange, production, institutional, care, network, ecological, or power relations are constitutive?	Reducing structure to pairwise interaction
Resources	What material, financial, informational, institutional, ecological, or symbolic means are relevant, and how are they accessed?	Equating possession with practical usability
Capacities	What can positions or configurations actually do, reproduce, or transform?	Treating observed performance as durable capability
Constraints	Which material, legal, institutional, social, cognitive, ecological, or historical limits shape feasible action?	Treating every constraint as a removable friction
Value	What counts as valuable, for whom, through which realization and comparison processes?	Presuming scalar commensurability
Time/history	How are sequence, duration, path dependence, reproduction, crisis, and future possibility represented?	Projecting static relations across historical change
Power	Through which dependencies, controls, positions, or institutions can differences become consequential influence?	Equating asymmetry with power
Evidence/method	Through which manifestations and methods are claims warranted?	Converting methodological difference into evidential equivalence
Generativity	How do present relations alter later capabilities, institutions, values, paths, and possibilities?	Treating novelty or growth as generativity

ordinate system is a structured set of comparative questions concerning analytical objects, subject positions, relations, resources, capacities, constraints, value forms, temporal and historical organization, power, evidence and method, and generativity, used to map economic theories while preserving their local semantics, mechanisms, scope conditions, and unresolved remainder.

The coordinate system is intentionally weaker than a unified meta-theory. It does not require every theory to populate every coordinate, and an empty coordinate can itself be informative. A theory centered on price coordination may say relatively little about care relations; a historical theory may resist a compact capacity representation; an experimental framework may bracket long-run generativity. The comparative task is to record such absences and asymmetries rather than fill them automatically with GRE vocabulary.

Table 21.3 summarizes the eleven coordinates and the reduction risk attached to each one.

Proposition 21.29 (Non-reductive coordinate condition). *A common comparison language remains theoretically legitimate only where each coordinate preserves the theory-specific semantics, mechanism, scale, evidential basis, and remainder required for the claim being compared.*

This condition governs the remainder of the chapter. Sections 21.4–21.11 will deepen several of these coordinates before the chapter turns to individual traditions.

21.3.1 Analytical Objects and Unit Boundaries

The first coordinate concerns what a theory treats as an economic object. The object can be an individual choice, household, firm, class relation, market, institution, network, ecological process, platform, flow, stock, aggregate, historical regime, or relational configuration. These objects are not merely labels for the same underlying unit. They carry different boundary assumptions about what belongs inside the explanation and what can remain external.

A theory that begins with individuals can reconstruct organizations through aggregation or strategic interaction. A theory that begins with class, institution, or production relation can treat the individual as a position within a wider structure. A macroeconomic model can represent sectors or aggregates that intentionally suppress micro-level heterogeneity. An ecological account can extend the object boundary beyond human transactions to material-energy throughput and biophysical regeneration. The common coordinate must therefore record *object formation* before asking whether theories agree.

Definition 21.30 (Analytical-object profile). An *analytical-object profile* specifies a theory's primary units, their boundaries, internal structure, relevant scales, admissible aggregation or decomposition relations, and the economically consequential relations excluded from the local object definition.

Object comparison is especially important where the same term hides different internal structure. "Firm" can denote a production function, nexus of contracts, governance institution, organizational capability, legal person, or power-bearing hierarchy. Treating these as automatically equivalent would make later comparison incoherent.

Proposition 21.31 (Object-boundary comparison condition). *Theories should be compared at the object level only after their units, boundaries, scales, and decomposition or aggregation rules have been specified sufficiently to determine whether apparent correspondence concerns the same economic object, a nested object, or only a functional analogy.*

Section 21.4 will develop this coordinate in greater detail across individuals, households, firms, classes, institutions, markets, networks, communities, ecologies, and relational configurations.

21.3.2 Subject Positions and Agency Profiles

The second coordinate asks which positions count as subjects and what forms of agency, standing, experience, responsibility, or affectedness those positions possess. A preference-bearing consumer, worker located in a production relation, capability-bearing person, household member, institutionally embedded actor, collective organization, ecological stakeholder, and artificial agent should not be placed into one subject category merely because each can appear on the left-hand side of a model equation.

Agency itself is multidimensional. A position can choose among represented alternatives without possessing authority to change the rules that generate those alternatives. A household can act collectively while containing internal conflict. A firm

can have legal standing and strategic capability without experience in the human sense. A future generation can be economically affected without present agency. The common coordinate therefore separates analytical subjecthood from moral standing, legal personhood, decision authority, contribution, representation, and exposure to consequences.

Definition 21.32 (Subject-position profile). A *subject-position profile* identifies the positions recognized by a theory together with their modeled forms of agency, choice, standing, contribution, experience, responsibility, representation, and affectedness.

This profile prevents one theory's subject assumptions from silently entering another. Behavioral modification of rational choice, for example, does not automatically produce the same subject as a capability or care framework; collective or artificial agency also requires separate reconstruction.

Proposition 21.33 (Subject-translation condition). *Translation between theoretical subjects requires the dimensions of agency and standing relevant to each theory to be mapped separately, with residual non-equivalence preserved where one theory attributes capacities or statuses absent from the other.*

Section 21.5 will use this coordinate to compare several major subject architectures directly.

21.3.3 Relational Structure and Interaction Mechanisms

Economic theories differ not only in their units but in the relations treated as constitutive. Exchange, production, ownership, labor, credit, care, contract, hierarchy, network connection, institutional rule, ecological dependency, class relation, and platform intermediation organize economic objects differently. A price-mediated exchange relation is not simply a generic tie with a numerical weight, just as a care relation cannot be reconstructed fully as bilateral transfer.

The common coordinate therefore distinguishes *interaction* from *relational constitution*. Some theories treat already constituted actors as interacting; others treat identities, capabilities, preferences, institutions, or positions as partly produced through relations. The distinction matters for explanation because changing a relation can either alter outcomes among stable actors or alter the actors and feasible actions themselves.

Definition 21.34 (Relational-mechanism profile). A *relational-mechanism profile* specifies the relations recognized by a theory, their directionality and symmetry, the objects they connect or constitute, the mechanisms through which they transmit effects, and the extent to which relational change transforms the participating positions themselves.

A common relational language should therefore avoid reducing all structure to pairwise edges. Institutions, norms, class positions, ecological systems, and markets can contain higher-order, rule-mediated, or field-like relations whose effects are not recoverable from isolated dyads.

Proposition 21.35 (Relational-structure preservation condition). *Cross-theoretical translation of relations is warranted only where the relevant directionality, mediation, constitutive role, scale, and mechanism are preserved; similarity of connected units*

alone does not establish relational equivalence.

Section 21.6 will expand this coordinate across the major relational structures used in economic theory.

21.3.4 Resource Forms and Access Pathways

The resource coordinate asks what means of action a theory recognizes and how those means become usable. Material inputs, land, labor time, money, credit, information, knowledge, infrastructure, institutional rights, ecological functions, reputation, data, attention, and social support can all operate as resources in different theoretical configurations. Their economic significance depends on more than possession.

A formal entitlement can fail to become practical access; information can be available but unintelligible; finance can exist without eligible borrowers; data can be stored without rights to use it; infrastructure can be present but unreachable. Resource comparison therefore needs an access and conversion layer. This also prevents a resource language from flattening distinctions among stocks, flows, rights, services, and relational conditions.

Definition 21.36 (Resource-access profile). *A resource-access profile specifies the resource forms recognized by a theory, their ownership or control conditions, access pathways, complementary requirements, conversion conditions, substitutability, depletion or renewal properties, and the positions able to mobilize them.*

The resource coordinate is therefore compatible with scarcity analysis without presuming that every scarcity is material or market-priced. Institutional standing, care time, verification capacity, ecological regeneration, and platform access can become economically consequential scarcities through different mechanisms.

Proposition 21.37 (Resource-usability condition). *Comparison of resources across theories should distinguish nominal availability, authorized access, practical usability, conversion into valued function, and subsequent depletion or regeneration before quantities are treated as directly comparable.*

Section 21.8 will later connect this coordinate to scarcity, distribution, allocation, and generative opportunity.

21.3.5 Capacity and Conversion Profiles

Capacity concerns what subjects, collectives, organizations, institutions, or configurations can actually do. Economic theories encode capacity through productivity, skill, human capital, capability, technology, organizational competence, bargaining strength, institutional capacity, learning, or adaptive potential. These representations can overlap while remaining non-equivalent.

Observed performance is an especially poor universal proxy for capacity. High output under extensive external support can coexist with weak independent capability; unused capacity can remain latent because complementary resources are missing; a collective can possess a capability no member possesses alone. The coordinate therefore separates capacity from current realization and includes the conversion

conditions through which resources become practicable function.

Definition 21.38 (Capacity-conversion profile). A *capacity-conversion profile* identifies the functions a position or configuration can perform, the resources and relations required for those functions, the conversion pathways connecting resources to realized activity, the conditions of capability reproduction, and the distinction between individual, collective, institutional, and infrastructural capacity where relevant.

This profile allows productivity, human capital, capability, and organizational competence to enter dialogue without being collapsed into one scalar variable.

Proposition 21.39 (Capacity-performance distinction). *Cross-theoretical comparison should distinguish observed performance from retained and regenerative capacity, and should identify the complementary relations through which a measured performance becomes possible.*

The distinction will become especially important when the chapter compares capability approaches, evolutionary economics, care economics, institutional analysis, and AI-mediated economic theories.

21.3.6 Constraint Architecture and Conditionality

Constraints define and transform feasible action. They can be material, financial, legal, institutional, informational, cognitive, ecological, temporal, organizational, social, or historical. Some constraints operate as scarcity; others protect rights, stabilize expectations, coordinate behavior, preserve ecological functions, or make collective action possible. A common language should therefore avoid identifying constraint with inefficiency.

Theories also differ in whether constraints are treated as fixed parameters, endogenous outcomes, institutional rules, historically accumulated structures, or objects of political contestation. A budget constraint and a legal prohibition may both delimit action while operating through very different mechanisms. Path dependence can create historically inherited constraints that are absent from a static representation of the same current resources.

Definition 21.40 (Constraint-architecture profile). A *constraint-architecture profile* specifies the constraints relevant to a theory, their sources, carriers, scales, temporal persistence, transformability, protective or coordinative functions, and the mechanisms through which they alter feasible actions or relational positions.

Constraint translation is therefore partly a question of conditionality. A theory can predict an effect under a constraint structure that another theory treats as institutionally mutable. Their disagreement may concern the mechanism, the boundary condition, or the level at which the constraint is considered endogenous.

Proposition 21.41 (Constraint-type distinction). *A common theoretical dialogue should preserve distinctions among enabling, protective, coordinative, restrictive, and historically inherited constraints, and should state whether each constraint is treated as exogenous, endogenous, or institutionally revisable within the theory under examination.*

This condition will also prevent later value and policy comparisons from equating “constraint relaxation” with improvement by definition.

21.3.7 Value Forms and Evaluation Interfaces

Economic theories attach value to different objects through different processes. Utility, willingness to pay, price, labor, surplus, capability, care, ecological function, relational goods, dignity, public value, and generative value do not occupy one semantic layer. Some are descriptive representations, some are evaluative criteria, some are institutional outcomes, and some combine positive and normative content.

The common coordinate must therefore record both the *value form* and the *evaluation interface*. A market price can function as an exchange ratio without exhausting welfare. A capability can be an evaluative space without being a scalar measure. Care can be economically consequential while resisting monetization. Ecological processes can matter through both instrumental and non-instrumental valuation. Translation becomes misleading when one value form is treated as the numeraire for all others without explicit warrant.

Definition 21.42 (Value-form profile). A *value-form profile* specifies what a theory treats as valuable or value-relevant, the subject or position to which the value is attributed, the mechanism through which it is realized or represented, the comparison or aggregation rule employed, and any remainder that resists translation into that rule.

Proposition 21.43 (Value-translation condition). *Translation among theoretical value concepts requires value carrier, realization mechanism, evaluative purpose, comparison rule, and residual incommensurability to be specified separately before numerical or conceptual correspondence is asserted.*

Section 21.7 will develop this coordinate through utility, labor, price, capability, care, ecological, relational, and generative value.

21.3.8 Temporal Structure and Historical Pathways

Time enters economic theory in heterogeneous forms: comparative statics, equilibrium adjustment, discounting, expectations, historical time, path dependence, evolutionary change, crisis, institutional reproduction, learning, technological transition, and irreversibility. A common temporal vocabulary must preserve these differences rather than placing every theory on one homogeneous clock.

Sequence matters when earlier events transform later feasible states. Duration matters when institutional learning or capability formation requires time. Timing matters in liquidity, coordination, care, and crisis. Historical inheritance matters where rules, infrastructures, ecological conditions, or social relations persist after the originating decision. Some theories foreground such processes; others deliberately compress them to isolate a local relation.

Definition 21.44 (Temporal-historical profile). A *temporal-historical profile* specifies the time structure used by a theory, including sequence, duration, anticipation, memory, path dependence, reproduction, irreversibility, crisis, transition, and the conditions under which earlier states alter later possibility structures.

A theory with an equilibrium concept is not thereby “ahistorical” in every use, and a historical theory need not reject local equilibrium reasoning. The dialogue should identify the temporal role of each representation relative to the claim.

Proposition 21.45 (Temporal-translation condition). *Temporal translation among theories is warranted only where the relevant ordering, duration, memory, irreversibility, and transition assumptions are made explicit; correspondence of static states does not establish equivalence of historical processes.*

Section 21.9 will compare these temporal structures directly.

21.3.9 Power Conversion and Control Positions

Power is often present in economic theory even when it is not named directly. Bargaining position, ownership, class relation, monopoly, hierarchy, agenda control, institutional authority, network centrality, platform gatekeeping, asymmetric information, legal standing, and capability asymmetry can all create differentiated influence. A common language must identify the conversion mechanism rather than treat every inequality as power.

The relevant question is how an asymmetry becomes consequential for another position's feasible action, access, value realization, or future possibilities. Control over infrastructure, standards, finance, data, employment, or institutional rules can mediate this conversion. Counter-power and credible exit can alter the relation without eliminating the underlying asymmetry.

Definition 21.46 (Power-conversion profile). *A power-conversion profile specifies the relevant asymmetry, dependency or exposure, control position, institutional or infrastructural mediation, consequences for feasible action, persistence mechanism, counter-capacity, and contestability through which differentiated capability becomes economically consequential influence.*

Proposition 21.47 (Power-mechanism condition). *Cross-theoretical claims about power should identify the mechanism converting asymmetry or position into consequential influence, and should distinguish that mechanism from the underlying difference in resources, capability, or status.*

Section 21.10 will use this coordinate to compare price coordination, hierarchy, class power, institutional power, bargaining, networks, capability asymmetry, care dependency, platform power, and relational power.

21.3.10 Evidence, Method, and Warrant

Theories differ in what counts as evidence and in how observations warrant claims. Deduction, econometrics, experiments, historical records, institutional comparison, ethnography, simulation, formal proof, case reconstruction, and mixed methods access different manifestations of economic reality. A common theoretical language must therefore include an evidential coordinate rather than compare theories only at the conceptual level.

Evidence does not enter theory without transformation. Administrative categories, survey instruments, experimental protocols, archival survival, model identification, coding rules, and qualitative interpretation all mediate the relation between observed trace and theoretical claim. Methodological difference can therefore produce genuine disagreement about what has been observed, not only how the observation should be explained.

Definition 21.48 (Evidence–method–warrant profile). An *evidence–method–warrant profile* specifies the manifestations used as evidence, the methods through which those manifestations are produced or interpreted, the inferential link connecting them to a theoretical claim, the uncertainty and exclusions involved, and the scope of warrant thereby supported.

This profile also preserves asymmetry among evidential regimes. A randomized intervention can identify a local causal effect without reconstructing its historical formation; an archival account can establish sequence and institutional context without identifying a counterfactual effect in the same way. Their contributions can be complementary without being interchangeable.

Proposition 21.49 (Evidential-translation condition). *Methods and evidence can enter common theoretical dialogue only where the inferential warrant of each evidential regime remains explicit; methodological plurality does not authorize treating unlike forms of evidence as equivalent support for the same claim.*

Section 21.11 will develop the methodological implications of this coordinate in detail.

21.3.11 Generativity and Future-Formation Effects

The final coordinate concerns how a theory represents the production of later possibilities. Growth, accumulation, innovation, learning, capability formation, reproduction, institutional change, ecological regeneration, path creation, and cultural or epistemic formation can all describe processes through which the future differs from the present. They should not be collapsed into one generic notion of generativity.

GRE uses generativity to ask how present relations alter later capacities, institutions, values, option structures, and paths. In theoretical dialogue this concept should function as a comparative question: *what does the theory allow to be generated, by whom or what, through which mechanism, over what horizon, and with what depletion or closure risks?* A theory may contain a strong account of innovation but a weak account of institutional reproduction; another may explain reproduction while leaving path creation underdeveloped.

Definition 21.50 (Theoretical generativity coordinate). A *theoretical generativity coordinate* specifies the processes through which a theory represents the creation, reproduction, transformation, depletion, or closure of later capabilities, relations, institutions, value forms, knowledge, infrastructures, and practical possibility structures.

The coordinate must also distinguish generativity from normative desirability. A process can generate new options while producing domination, ecological depletion, or exclusion. Conversely, maintenance can be generative when it preserves the substrate from which future activity remains possible.

Proposition 21.51 (Generativity-translation condition). *Cross-theoretical comparison of generative processes requires the generated object, generating mechanism, temporal horizon, reproduction conditions, depletion effects, affected positions, and normative status to remain separately specified.*

The eleven coordinates developed in this section provide a common interface for the remainder of Chapter 21. They do not assert that every economic theory contains

the same relational ontology. They make explicit the questions required to test correspondence, partial translation, functional analogy, or irreducible difference.

Sections 21.4–21.11 now deepen the comparative architecture by examining units of analysis, subjects and agency, relations and structures, value and commensuration, scarcity and distribution, time and change, power and coordination, and evidence and method. The common language introduced here should therefore be read as a disciplined coordinate system whose legitimacy depends on preserving theoretical specificity at every subsequent stage of dialogue.

21.4 Economic Objects across Analytical Units

This section develops the object-level coordinate introduced in Section 21.3 by distinguishing the *unit of analysis* from the *economic object* represented at that unit. Its role is to provide a disciplined basis for comparing theories that begin with individuals, households, firms, classes, institutions, markets, networks, communities, ecologies, or wider relational configurations. The objective is not to select a privileged unit. It is to specify how a unit acquires analytical boundaries, which relations are internalized or externalized, how aggregation and decomposition are performed, and when a change of scale changes the economic object itself. The discussion proceeds from relatively familiar units toward increasingly composite configurations and concludes with a multi-level relational object capable of preserving cross-scale dependence without treating every scale as analytically interchangeable.

A unit of analysis is the locus at which attributes, events, relations, or outcomes are indexed for a particular claim. An economic object is the bounded configuration whose properties or transformations the claim seeks to explain. The two can coincide, but they need not. A person can be the unit at which income is measured while the relevant object is a household distribution system, labor relation, or institutional entitlement. A firm can be the unit in administrative data while the explanatory object is a supply network or regulatory field. Conversely, an aggregate can be the unit of observation while the object of interest remains a distribution of heterogeneous positions within it.

Definition 21.52 (Analytical-unit and economic-object profile). An *analytical-unit and economic-object profile* specifies, for a given claim, the unit at which evidence or attributes are indexed, the economic object whose mechanism is being represented, the boundary that separates internal from external relations, the relevant scale, admissible aggregation and decomposition rules, and the relations whose exclusion may alter the interpretation of the claim.

The distinction is important for theoretical dialogue because apparent disagreements can arise from different object boundaries rather than incompatible causal claims. The same empirical event can be represented as individual choice, household adaptation, firm restructuring, class redistribution, institutional change, network propagation, market adjustment, or ecological pressure. These descriptions can conflict, nest, or illuminate different mechanisms. Comparison therefore requires boundary reconstruction before adjudication.

Proposition 21.53 (Unit–object separation condition). A *theoretical comparison* is

Table 21.4: Analytical units and characteristic economic-object boundaries

Unit	Characteristic object boundary	Principal boundary risk
Individual	Person-level choice, capability, income, labor, or experience	Externalizing constitutive social and institutional relations
Household	Resource pooling, care, reproduction, joint constraint, intra-household allocation	Treating internal distribution and conflict as homogeneous
Firm	Production, governance, contracts, capability, hierarchy, organizational memory	Treating the legal or accounting boundary as the causal boundary
Class	Relational position in production, ownership, distribution, or reproduction	Reifying a relational position into a fixed homogeneous group
Institution	Rule-bearing and role-bearing configuration with enforcement and interpretation	Equating formal rule text with operational institution
Market	Price, exchange, matching, competition, coordination, and participation architecture	Treating market boundary and participation conditions as exogenous
Network	Positional structure of ties, flows, dependencies, and propagation	Reducing typed relations to generic edges
Community	Collective relation, shared infrastructure, norms, memory, and mutual support	Romanticizing cohesion or suppressing internal heterogeneity
Ecology	Material-energy relations, regenerative processes, thresholds, and human–nonhuman dependence	Treating biophysical conditions as external constraints only
Relational configuration	Multi-level history-bearing arrangement of objects and relations	Expanding the object until local mechanisms lose identification

well specified only where the unit at which evidence is indexed is distinguished from the economic object whose mechanism is being explained whenever those two structures differ.

Table 21.4 summarizes the ten object architectures developed in this section. The table is not a hierarchy. Each unit is analytically useful where its boundary preserves the relations relevant to the local claim.

21.4.1 Individual Analytical Unit

The individual remains one of the most important analytical units in economics because many consequential variables and decisions are person-indexed: consumption, labor supply, education, income, health, preference expression, capability, and exposure to policy can all be measured or represented at this level. The analytical usefulness of the individual, however, depends on what the claim attributes to the person and which relations are treated as constitutive of the observed state.

An individual can be represented as a preference bearer, decision maker, worker, capability-bearing person, rights holder, debtor, caregiver, learner, platform user, or

historically situated participant. These representations are not equivalent. A person-level choice can depend on household bargaining, employer authority, legal status, infrastructure, social expectation, algorithmic mediation, or ecological conditions. Individual indexing therefore does not establish individual causal sufficiency.

Definition 21.54 (Individual-unit profile). An *individual-unit profile* specifies the person-indexed attributes or events relevant to a claim together with the relational, institutional, historical, and material conditions required to interpret those attributes or events.

The individual unit is strongest where the mechanism genuinely operates through person-level variation or where normative standing requires person-sensitive incidence. It becomes weaker when aggregation silently converts relationally generated states into intrinsic personal properties. Income, employability, productivity, or observed preference may partly reflect positions and opportunities produced elsewhere in the configuration.

Proposition 21.55 (Individual-boundary adequacy condition). *Person-level analysis is adequate for a claim only where relations externalized from the individual boundary do not contain mechanisms necessary to interpret the person-level state or where those mechanisms are represented explicitly as conditioning structures.*

21.4.2 Household Economic Configuration

The household is frequently used as a unit for consumption, saving, poverty, labor allocation, fertility, care, housing, and welfare analysis. Its analytical significance arises from resource pooling, shared constraints, interdependent decisions, care obligations, reproduction, and the conversion of market and public resources into daily life. These mechanisms make the household more than a simple aggregation of individuals.

Household boundaries are nevertheless heterogeneous. Legal household, dwelling unit, family, care network, tax household, consumption unit, and remittance network can differ. Resources entering the household need not be distributed equally, and a common budget does not imply common preferences or symmetric bargaining power. Household-level welfare indicators can therefore conceal person-level deprivation or dependence.

Definition 21.56 (Household economic-object profile). A *household economic-object profile* identifies the membership rule, resource-pooling structure, internal allocation processes, care and reproduction relations, authority or bargaining structure, external dependencies, and temporal continuity through which a household becomes an economic object for a given claim.

The profile allows household analysis to remain useful without presuming a unitary actor. It also permits cross-theoretical comparison between models that treat the household as a decision unit and approaches that emphasize intra-household power, unpaid labor, care, or intergenerational reproduction.

Proposition 21.57 (Household-composition condition). *Household-level explanation should preserve internal allocation, dependency, and standing whenever those relations can alter person-level outcomes or the household's external economic behavior.*

21.4.3 Firm Organizational Configuration

The firm can be represented as a production unit, legal person, nexus of contracts, governance arrangement, hierarchy, capability repository, employer, innovating organization, platform, or node within a supply network. These representations often share an empirical name while assigning different causal boundaries to the object.

Accounting and legal boundaries provide important information, but they need not coincide with the boundary of production or control. Outsourcing can move workers outside a firm's payroll while leaving operational dependence intact. Intellectual property and platform rules can extend control beyond ownership of productive assets. Supplier relations can make capabilities distributed across organizations. Conversely, a legally integrated corporation can contain semi-autonomous divisions with different technologies and decision structures.

Definition 21.58 (Firm organizational-object profile). *A firm organizational-object profile specifies the organizational boundary relevant to a claim, including production relations, control rights, contractual interfaces, internal hierarchy, capability and knowledge distribution, external dependencies, and the relation between legal, accounting, operational, and causal boundaries.*

This formulation permits theories of production, transaction, governance, capability, labor, and power to be compared without presuming that they describe the same firm object. It also makes boundary change itself analytically visible when merger, outsourcing, franchising, platformization, automation, or financial restructuring alters the organization.

Proposition 21.59 (Firm-boundary correspondence condition). *Claims about firms should identify which organizational boundary carries the proposed mechanism; correspondence between theories cannot be inferred solely from their use of the term "firm."*

21.4.4 Class Position and Reproduction

Class differs from the preceding units because it is principally relational. A class position is constituted through patterned relations to production, ownership, labor, surplus, authority, or distribution rather than by spatial membership or legal incorporation alone. Class analysis therefore changes the object of explanation: individual and organizational attributes can be interpreted partly as effects of recurrent structural positions.

A class object can be specified at different resolutions. Broad relations between owners and workers may be analytically useful for some historical processes, while occupational fractions, managerial positions, financial claims, informal labor, status, geography, or care responsibilities may matter for others. The unit should remain sufficiently differentiated to preserve the mechanism being studied.

Definition 21.60 (Class-position profile). *A class-position profile specifies the relational criteria through which positions are constituted, the resources or claims attached to those positions, their reproduction mechanisms, internal heterogeneity, mobility pathways, and the scale at which common interests or constraints are analytically attributed.*

Class therefore should not be treated as a demographic label detached from the

relation that constitutes it. Nor should relational constitution imply perfect homogeneity among occupants of a class position. Historical institutions, gender, race, citizenship, skill, geography, sector, and organizational authority can mediate how the position is experienced and reproduced.

Proposition 21.61 (Relational-class condition). *Class functions as a coherent economic object only where the relation constituting the class position and the mechanism reproducing or transforming that position are specified separately from the empirical characteristics of current position holders.*

21.4.5 Institutional Economic Configuration

Institutions enter economic explanation through rules, roles, expectations, enforcement, interpretation, routines, rights, obligations, and organizational carriers. The institution is therefore rarely exhausted by a written rule. A property regime, labor standard, monetary arrangement, welfare entitlement, procurement system, professional norm, or platform governance rule becomes economically effective through enactment and reproduction across multiple positions.

Institutional boundaries can cut across organizations. The same rule may be administered by several agencies, interpreted by courts, operationalized by firms, and navigated by households. Informal practices can supplement or displace formal requirements. Institutional change can occur through formal amendment, reinterpretation, implementation drift, technological substitution, or changes in the subjects capable of invoking a rule.

Definition 21.62 (Institutional economic-object profile). *An institutional economic-object profile specifies the rule or norm complex, recognized positions, enforcement and interpretation mechanisms, organizational carriers, practical enactment, historical reproduction, and interfaces through which the institution alters economic possibilities and obligations.*

This profile distinguishes the institution from both a single organization and a pure rule statement. It also permits institutional effects to be investigated across scales, including cases where local implementation transforms the practical institution without changing its formal text.

Proposition 21.63 (Institutional-enactment condition). *Institutional analysis is complete for a local claim only where the operative relation between formal rule, interpretation, enforcement, organizational carrier, and practical enactment is represented at the scale relevant to the claimed effect.*

21.4.6 Market Coordination Configuration

A market can be modeled as a set of exchanges, a price-formation mechanism, a matching process, a competitive field, an institutionally constituted arena, or a historically embedded coordination configuration. These descriptions differ in what they treat as endogenous. Participation rights, product definitions, information, payment systems, property rules, contract enforcement, standards, infrastructure, and market-making institutions can all be conditions of the market rather than external background.

Market boundaries also vary by purpose. A geographic market used in competition analysis can differ from a technological ecosystem, labor market, financial market, platform marketplace, or informal exchange network. The relevant object can further change as substitution, regulation, infrastructure, or digital intermediation alters who can participate and what counts as a comparable good or service.

Definition 21.64 (Market-configuration profile). *A market-configuration profile specifies the exchanged or matched objects, participant-entry conditions, coordination mechanism, price or non-price signals, institutional supports, information structure, substitution relations, spatial and temporal boundary, and dependencies through which the market is reproduced.*

The profile avoids treating “the market” as a boundary-free mechanism. It also allows theories to disagree productively about whether specific institutional conditions are constitutive of market coordination or merely affect outcomes within an already defined market.

Proposition 21.65 (Market-boundary endogeneity condition). *Where participation, product definition, information, infrastructure, or institutional support materially alters the coordination mechanism, those conditions should be treated as part of the market object or explicitly modeled boundary conditions rather than presumed exogenous.*

21.4.7 Network Positional Structure

Network analysis shifts attention from isolated attributes toward positional structure. Firms, households, banks, workers, communities, technologies, or institutions can acquire economic significance through connectivity, centrality, brokerage, dependency, clustering, multiplex relations, and paths through which resources or disturbances propagate.

A network object is not defined by connectivity alone. Edge type matters. Credit exposure, ownership, information exchange, friendship, supply dependence, migration, care, and platform interaction transmit different effects. Direction, weight, timing, contractual status, substitutability, and higher-order group structure can also change the meaning of a network position.

Definition 21.66 (Economic-network object profile). *An economic-network object profile specifies nodes, typed relations, directionality, intensity, temporal structure, positional measures, propagation mechanisms, boundary rules, and the higher-order structures required to interpret economic dependence or coordination within the network.*

Network boundaries deserve special care because observed data often include only a subset of relations. A measured network can therefore be a manifestation of a wider relational structure rather than the object in full. Positional inference should remain indexed to the sampled or institutionally visible network.

Proposition 21.67 (Typed-network condition). *Network comparison across theories preserves economic meaning only where relation type, direction, propagation mechanism, temporal scope, and boundary construction remain explicit; generic connectivity alone is insufficient to establish structural equivalence.*

21.4.8 Community Economic Configuration

Community becomes economically relevant where repeated social relations, shared infrastructures, collective memory, norms, mutual support, common resources, identity, or localized knowledge alter production, care, exchange, resilience, or distribution. The community object can therefore capture relations that remain difficult to represent through household, firm, or market units alone.

Community boundaries are rarely simple. Residence, kinship, language, occupation, religion, digital participation, shared resource use, or political membership can produce overlapping communities. Internal disagreement and hierarchy can coexist with solidarity. Community analysis therefore requires attention to membership, exit, voice, exclusion, internal distribution, and the institutions through which collective capacity is maintained.

Definition 21.68 (Community economic-object profile). A *community economic-object profile* specifies the basis of membership, shared relations and infrastructures, collective capacities, internal differentiation, boundary and exclusion practices, memory and reproduction mechanisms, and external interfaces through which community structure becomes economically consequential.

This formulation permits community to enter economic analysis without romanticizing cohesion or reducing collective relations to individual social capital. A community can support generativity while also containing exclusion, dependency, or unequal authority.

Proposition 21.69 (Community-heterogeneity condition). *Community-level economic explanation should preserve internal differentiation and boundary processes whenever cohesion, exclusion, authority, or unequal access materially affects the collective mechanism being analyzed.*

21.4.9 Ecological Economic Configuration

Ecological analysis expands the economic object beyond human institutional and transactional boundaries. Energy, material throughput, land, water, biodiversity, climate, ecosystem functions, regenerative rates, pollution sinks, and threshold processes can be constitutive of production and reproduction rather than external conditions appended after an economic model is specified.

The relevant ecological boundary depends on the process. A supply chain can depend on watershed conditions far from the point of sale; a local production system can contribute to cumulative atmospheric effects; an ecosystem can regenerate on a timescale different from investment or policy cycles. Economic and ecological units therefore frequently fail to align spatially or temporally.

Definition 21.70 (Ecological economic-object profile). An *ecological economic-object profile* specifies the biophysical processes, material and energy flows, regenerative capacities, thresholds, affected human and nonhuman systems, spatial extent, temporal scale, and economic interfaces required to represent a claim about economic dependence on ecological conditions.

This profile does not imply that every economic claim requires full ecological reconstruction. It establishes the narrower requirement that ecological relations be-

come internal to the economic object when excluding them would change the mechanism, feasible set, reproduction condition, or long-run interpretation of the claim.

Proposition 21.71 (Ecological-boundary inclusion condition). *Biophysical processes belong within an economic object's explanatory boundary where they materially condition the creation, maintenance, depletion, or regeneration of the economic relations or capacities at issue.*

21.4.10 Multi-Level Relational Configuration

The final object architecture treats economic phenomena as potentially distributed across several units at once. Individuals act within households and organizations; firms participate in markets and networks; institutions shape all of these positions; communities reproduce capabilities and norms; ecological systems condition material possibility. A multi-level relational configuration provides a way to represent such coupling without declaring one scale universally fundamental.

The usefulness of this object depends on disciplined containment. Enlarging the boundary can reveal cross-scale mechanisms, but an indefinitely expanding configuration can make explanation unfalsifiable and local identification impossible. Multi-level analysis therefore requires explicit rules for which units and relations are included, how states at one level are generated from or constrain another, and which remainder stays outside the local model.

Definition 21.72 (Multi-level relational economic object). *A multi-level relational economic object is a bounded history-bearing configuration in which two or more analytical units are connected through specified cross-level relations, with explicit rules for aggregation, decomposition, conditioning, feedback, and temporal propagation.*

The object is particularly useful when causal direction crosses levels. Household decisions can affect labor markets while labor-market institutions alter household possibilities; firm strategies can reshape networks while network structure changes firm capability; ecological degradation can alter production while production changes ecological regeneration. These are coupled processes rather than independent levels stacked beside one another.

Proposition 21.73 (Cross-level mechanism condition). *A multi-level relational configuration is warranted only where the cross-level relations add identifiable explanatory content beyond separate single-unit analyses and where aggregation, decomposition, feedback, and boundary assumptions remain explicit.*

The analysis of units and economic objects therefore yields a plural but disciplined object architecture. Individuals, households, firms, classes, institutions, markets, networks, communities, and ecologies can each be legitimate analytical units, while the economic object relevant to a claim may coincide with, contain, cut across, or be constituted through relations among them. Theoretical dialogue should consequently compare object boundaries before comparing results produced within those boundaries.

This object-level clarification prepares Section 21.5. Once the unit and object boundary are specified, the next question concerns which positions within or across those objects possess agency, standing, experience, responsibility, contribution, rep-

resentation, or affectedness. Subject architecture can then be compared without conflating the entity selected for analysis with the subject recognized by a theory.

21.5 Economic Agency across Subject Architectures

This section develops the subject-position coordinate introduced in Section 21.3 and follows the object-level analysis of Section 21.4. Its role is to distinguish the *economic object* represented by a theory from the *subject positions* to which that theory attributes choice, initiative, capability, responsibility, representation, standing, or exposure to consequences. The objective is not to identify one canonical economic subject. It is to reconstruct several recurrent subject architectures and to specify the dimensions along which they can be compared without treating preference, class position, institutional embeddedness, bounded rationality, capability, relational constitution, collective action, or artificial agency as equivalent descriptions of the same actor. The discussion therefore moves from relatively familiar individual subject forms toward relational, collective, and artificial agency, and closes by specifying the boundaries of subject translation.

A subject position is not defined merely by occupying a unit of analysis. A household can be an economic object while individual members remain differentiated subjects; a corporation can be an organizational object to which strategic actions are attributed even though experience and responsibility are distributed among persons and institutional procedures; a future generation can be affected by present decisions without possessing present decision authority. Likewise, agency is multidimensional. Choosing among available alternatives, initiating a new course of action, negotiating, refusing, coordinating, revising rules, representing others, and sustaining collective action can depend on different capacities and institutional permissions.

Definition 21.74 (Economic subject-agency profile). An *economic subject-agency profile* specifies, for a theory or claim, the positions recognized as subjects together with their attributed forms of choice, initiative, capability, rule-changing authority, representation, responsibility, legal standing, experiential status, and affectedness, including the relations and institutions that enable or constrain those attributes.

The profile deliberately separates analytical subjecthood from moral or legal conclusions. A model can attribute decision capability to a firm without establishing that the firm has human experience; an institution can represent a community without exhausting the standing of its members; an artificial system can execute economically consequential actions without resolving questions of consciousness, moral status, or ultimate responsibility. These distinctions are necessary for both theoretical comparison and economic governance.

Proposition 21.75 (Subject-agency separation condition). *Cross-theoretical comparison of economic subjects is adequate only where the dimensions of agency, standing, responsibility, representation, and affectedness relevant to the local claim are distinguished rather than inferred from a single generic category of actor.*

Table 21.5 summarizes the subject architectures developed in this section. The rows should be read as comparative profiles rather than mutually exclusive ontological classes. The same person or organization can occupy several subject positions

Table 21.5: Subject architectures and characteristic agency questions in economic theory

Subject architecture	Principal agency emphasis	Characteristic translation risk
Preference-bearing	Choice over represented alternatives and preference ordering	Equating observed choice with complete welfare or autonomous preference formation
Class-positioned	Action conditioned by relational position in production, ownership, and distribution	Inferring common agency directly from common structural position
Institutionally embedded	Role-mediated permission, obligation, interpretation, and rule use	Treating institutions only as external constraints on otherwise unchanged actors
Bounded-rationality	Procedural choice under limited information, cognition, and attention	Treating cognitive limitation as absence of agency or as a purely individual defect
Capability-bearing	Substantive possibility to realize valued doings and beings	Equating resources, formal permission, achieved functioning, and capability
Relationally constituted	Subject properties partly generated through recurrent relations and histories	Dissolving attributable agency into structure or treating relations as incidental context
Collective	Coordinated action through procedures, roles, representation, and shared capacity	Treating organizational action as unanimous member preference
Artificial	Delegated or system-mediated action through computational and institutional interfaces	Inferring moral standing, experience, or autonomous responsibility from functional performance
Translation boundary	Dimension-by-dimension correspondence among heterogeneous subject forms	Forcing equivalence where theories distribute agency and standing differently

simultaneously, and a theory can combine more than one architecture.

21.5.1 Preference-Bearing Economic Subjects

A preference-bearing subject is represented through an ordering, valuation, or choice relation over available alternatives. This architecture is powerful when the relevant economic problem concerns trade-offs among represented options, demand, allocation, response to incentives, or welfare analysis under an explicit preference structure. Its analytical economy also makes clear which aspects of subjecthood are being bracketed: the origin of preferences, the constitution of the feasible set, interpersonal relations, institutional permissions, and the capacity to alter the choice architecture can remain outside the local representation unless modeled separately.

Choice therefore should not be treated as a complete synonym for agency. A person can choose among menu items without having the authority to define the menu, alter prices, change participation rules, or develop the capacities required to use an option. Observed choice can also be shaped by information, habit, social expectation, bargaining position, adaptive response, or institutional design. These conditions do not invalidate preference-based analysis; they determine the scope within which the

inferred subject architecture is adequate.

Definition 21.76 (Preference-choice agency profile). A *preference-choice agency profile* specifies the alternatives represented to a subject, the preference or valuation relation used to order them, the information and constraints relevant to choice, the stability or formation assumptions attached to preferences, and the authority the subject possesses to modify the choice environment itself.

The last element is important for translation. Two theories can both describe a person as choosing while assigning very different significance to that choice. One can treat the ordering as a sufficient representation of the local decision; another can regard the ordering as historically or socially formed and therefore as one manifestation of a wider subject configuration.

Proposition 21.77 (Choice-domain adequacy condition). *Preference-based subject representation is adequate for a local claim where the relevant mechanism is carried by choice among represented alternatives and where omitted processes of preference formation, feasible-set construction, or rule revision do not materially change the interpretation of that claim.*

21.5.2 Class-Positioned Economic Subjects

Class-positioned subjecthood begins from a different analytical premise. The subject is located in recurrent relations of production, ownership, labor, authority, surplus, or distribution that condition incentives, vulnerabilities, resources, and possible forms of action. The subject is therefore neither reducible to personal attributes nor fully determined by structural position. A class position can shape action without producing a homogeneous consciousness, identical interest, or automatic capacity for collective coordination.

This distinction separates *position* from *agency through the position*. Workers exposed to a common labor relation can differ in contract status, citizenship, care responsibilities, skill, geography, organizational membership, or access to exit. Owners and managers can occupy distinct control positions even where both receive income connected to the same organization. A class theory must therefore specify which relation constitutes the position and which mechanisms translate that position into behavior, interests, organization, or historical change.

Definition 21.78 (Class-position agency profile). A *class-position agency profile* specifies the relation constituting a class position, the resources and constraints attached to that position, the mechanisms through which occupants interpret or act from it, the conditions of coordination among similarly positioned subjects, and the sources of internal differentiation that can modify common action.

A class-positioned subject can therefore be compared with a preference-bearing subject without translating class into a fixed preference type. The former makes relational location part of subject constitution; the latter can remain useful for particular decisions within that position.

Proposition 21.79 (Position-action mediation condition). *A structural position supports an agency claim only where a mechanism connecting the position to interpretation, capacity, coordination, or action is specified; common position alone does not es-*

establish common agency.

21.5.3 Institutionally Embedded Economic Actors

Institutionally embedded actors act through positions whose permissions, obligations, categories, procedures, and expectations are partly supplied by institutions. A central-bank official, corporate director, welfare claimant, licensed professional, contract holder, public servant, or platform participant can possess forms of agency that depend on recognized roles rather than on private resources alone. Institutions can constrain action, but they can also enable actions that would otherwise be unavailable by establishing authority, enforceable claims, recognized procedures, and common expectations.

Institutional embeddedness therefore changes both feasible action and the meaning of action. Signing a document can create an obligation only where the signer occupies an authorized position and the surrounding institutional configuration recognizes the act. Voting inside an organization, invoking an entitlement, exercising fiduciary authority, or enforcing a contract similarly depends on rule-mediated standing. At the same time, actors interpret, reproduce, contest, and sometimes transform the institutions through which they act.

Definition 21.80 (Institutionally embedded agency profile). *An institutionally embedded agency profile specifies the role occupied by an actor, the permissions and obligations attached to that role, the institutional resources available through it, the interpretive and discretionary space within the role, and the pathways through which role enactment can reproduce, contest, or modify the institution.*

This profile prevents institutional analysis from treating rules as an environment external to otherwise unchanged actors. It also prevents the opposite reduction in which the role exhausts the person or organization occupying it. Institutional positions mediate agency while leaving room for heterogeneous interpretation, competence, resistance, and interaction with other positions.

Proposition 21.81 (Institutional-mediation condition). *Where an action depends on role-specific authority, entitlement, obligation, or procedure, the institutional mediation of agency should be represented as part of the subject architecture rather than as an external constraint alone.*

21.5.4 Bounded-Rationality Agency Profiles

Bounded-rationality approaches alter the subject architecture by making decision procedures, limited information, finite cognition, search cost, attention, heuristics, satisficing, and learning analytically relevant. The subject remains capable of purposeful action, but the process through which action is selected can no longer be represented solely by a fully specified optimization problem with costless access to all relevant information.

Boundedness should not be interpreted as a purely personal deficiency. The information environment is partly designed through institutions, interfaces, organizations, professions, and technologies. An actor can appear poorly informed because crucial information is inaccessible, badly classified, strategically withheld,

or too costly to verify. Organizational routines and social knowledge can also expand practical rationality beyond what an isolated individual could calculate. The boundary of the cognitive subject therefore interacts with the surrounding epistemic configuration.

Definition 21.82 (Bounded-rationality agency profile). *A bounded-rationality agency profile specifies the decision task, information available to the actor, cognitive and attentional limits, search and verification costs, decision procedures or heuristics, learning opportunities, environmental supports, and the consequences of those bounds for attainable action.*

This profile provides a translation bridge between choice-oriented and institutionally or relationally embedded theories. The bridge remains partial: introducing cognitive limits does not by itself establish that preferences, identities, or capabilities are relationally constituted.

Proposition 21.83 (Procedural-agency condition). *Where decision procedures and information-processing limits materially affect behavior, theoretical comparison should represent those procedures and their environmental supports rather than inferring agency solely from the observed outcome of choice.*

21.5.5 Capability-Bearing Persons

Capability-oriented subject architecture shifts attention from resources or chosen outcomes toward the substantive possibilities available to persons. A person can possess income or a formal entitlement while lacking the practical ability to convert it into mobility, education, health, participation, communication, or other valued functionings. Conversely, two persons with similar observed achievements can possess different opportunity structures because one outcome is freely chosen while the other results from severe constraint.

This architecture requires several distinctions. Resource possession differs from conversion capacity. Achieved functioning differs from the capability set from which it could have been chosen. Capability differs from expressed preference because adaptation to deprivation can alter what a person reports or seeks. Agency also extends beyond personal welfare when persons pursue commitments, relationships, or collective goals that they value independently of their own achieved functioning.

Definition 21.84 (Capability-bearing subject profile). *A capability-bearing subject profile specifies the resources and entitlements available to a person, relevant personal and relational conversion conditions, substantive attainable functionings, constraints on selection among those possibilities, and the person's practical capacity to pursue valued individual or collective purposes.*

Capability therefore provides a richer account of practical possibility without eliminating the need to specify institutions, relations, or power. The same nominal capability can be fragile where it depends on discretionary support, inaccessible infrastructure, hidden dependency, or a gatekeeper whose cooperation is uncertain.

Proposition 21.85 (Capability-agency correspondence condition). *A capability claim supports an agency interpretation only where practical attainability and relevant conversion conditions are represented; nominal resources, formal permission, or observed*

functioning alone do not establish the corresponding substantive agency.

21.5.6 Relationally Constituted Subject Positions

Relationally constituted subjecthood treats some economically consequential properties of subjects as generated or stabilized through recurrent relations. Preferences can be socially formed, skills can depend on institutions and collaborators, identities can be attached to roles, bargaining capacity can emerge from organization, and expectations can be shaped through repeated interaction. A subject can therefore remain identifiable while some of the attributes relevant to economic action are historically produced through the configuration in which the subject participates.

Relational constitution should be stated with restraint. It does not require the claim that the subject has no continuity apart from any particular relation, nor that every attribute is socially generated. The analytical burden is to identify which property is relation-dependent, through what mechanism, over what timescale, and with what degree of persistence after the relation changes. This preserves attributable agency while allowing agency itself to be historically formed.

Definition 21.86 (Relationally constituted subject profile). *A relationally constituted subject profile identifies the subject properties relevant to a claim, the relations through which those properties are generated, maintained, or transformed, the historical duration of that dependence, and the extent to which the subject retains continuity and actionable capacity across relational change.*

The profile is particularly important for theoretical translation because a theory of fixed actors interacting can reproduce the same observed pattern as a theory in which interaction changes the actors themselves. Their predictions may overlap locally while their accounts of intervention, learning, and historical change differ substantially.

Proposition 21.87 (Relational-constitution identification condition). *A claim that an economic subject is relationally constituted is warranted only where the relation-dependent property and the mechanism generating or reproducing that property are identified separately from ordinary interaction among otherwise stable subjects.*

21.5.7 Collective Economic Agency

Economic action is frequently attributed to collectives: firms invest, unions bargain, governments tax, cooperatives allocate, communities maintain infrastructure, and professional associations establish standards. Such language can be analytically legitimate when collective action is produced through procedures that coordinate differentiated participants across time. Collective agency does not require unanimous preference, identical experience, or complete internal cohesion.

The relevant question is how action becomes attributable to the collective. Decision rules, delegated authority, representation, routines, information systems, memory, enforcement, resource pooling, and recognized external standing can transform many individual contributions into a persistent action-capable configuration. Internal disagreement remains relevant because representation can be incomplete and collective actions can distribute benefits, burdens, or responsibility unevenly among

members.

Definition 21.88 (Collective agency profile). A *collective agency profile* specifies the membership or constituency relevant to a claim, decision and coordination procedures, representative or delegated roles, collective resources and memory, persistence across member turnover, external standing, internal contestability, and the allocation of responsibility for collective action.

This definition separates collective agency from aggregation. A statistical group can exhibit correlated behavior without possessing any procedure for common action. Conversely, a legally or organizationally constituted body can act despite disagreement among its members because authorized procedures generate decisions attributable to the collective.

Proposition 21.89 (Collective-attribution condition). *Economic action should be attributed to a collective only where a coordination, authorization, or reproduction mechanism connects differentiated participants to the action in a way that persists beyond coincident individual behavior.*

21.5.8 Artificial Economic Agency

Artificial systems increasingly mediate economically consequential activities such as recommendation, pricing, matching, forecasting, scheduling, trading, screening, contracting, content generation, and resource allocation. The language of agency becomes useful when such systems select or initiate actions within an operational environment, yet the attribution requires careful typing. Functional action, delegated authority, institutional authorization, legal standing, moral standing, experiential status, and ultimate responsibility are distinct questions.

An artificial system can therefore be analyzed as an economic agent for a bounded operational claim without presuming consciousness or independent moral personhood. The economically relevant configuration includes the system's action space, objective or instruction structure, training and input dependencies, delegated permissions, human and organizational oversight, infrastructure, update pathway, auditability, and the parties who bear consequences. Agency can also be distributed: a human–AI workflow may generate actions that cannot be explained adequately by either the software or the nominal human operator in isolation.

Definition 21.90 (Artificial economic-agency profile). An *artificial economic-agency profile* specifies the actions an artificial system can select or execute, the information and computational processes supporting those actions, the authority delegated to the system, operational dependencies, oversight and override pathways, persistence and update conditions, affected positions, and the institutional allocation of responsibility for resulting actions.

The profile is designed to prevent capability from silently becoming status. Greater forecasting, generation, or operational autonomy can alter dependency and control relations without determining whether the system possesses experience, moral standing, or legal personhood. Those questions require separate premises and forms of evidence.

Proposition 21.91 (Artificial-agency attribution condition). *Attributing economic*

agency to an artificial system is analytically warranted for a local claim where the system has a specified action space, a mechanism connecting inputs to consequential action, and an identifiable authorization and responsibility architecture; functional agency alone does not establish experiential or moral status.

21.5.9 Subject-Translation Boundaries

The preceding architectures show why theoretical dialogue should not begin by replacing every subject with a generic “actor.” Preference-bearing, class-positioned, institutionally embedded, bounded-rationality, capability-bearing, relationally constituted, collective, and artificial subjects distribute agency across different dimensions. Some theories emphasize selection among alternatives; others emphasize the formation of those alternatives, the positional structure conditioning action, the capability to convert resources into function, or the procedures through which many participants act collectively.

A subject translation should therefore be dimension-by-dimension. Choice can correspond without capability; legal standing can correspond without experiential status; collective decision authority can correspond without unanimity; affectedness can exist without present agency; responsibility can remain with human or institutional principals even where an artificial system performs the proximate action. Translation is strongest where these dimensions align through identifiable mechanisms and weakest where the same label conceals different architectures.

Definition 21.92 (Subject-translation profile). *A subject-translation profile maps two or more theoretical subject positions across choice, initiative, capability, institutional authority, relational constitution, representation, responsibility, legal standing, experiential status, and affectedness, while recording dimensions for which correspondence is partial, absent, or presently indeterminate.*

This profile operationalizes the broader non-reductive translation discipline of Section 21.3. It also anticipates the relational analysis of Section 21.6: subject properties and agency claims often depend on the relations and structures through which positions are constituted. Later theoretical comparison can therefore ask whether two traditions disagree about the subject itself, about the relations producing the subject’s action space, or about the normative standing attributed to positions affected by economic change.

Proposition 21.93 (Subject-translation boundary condition). *Cross-theoretical subject translation is adequate only where correspondence is established separately for the dimensions relevant to the claim and where non-equivalence in agency, standing, representation, responsibility, or affectedness remains explicit rather than being absorbed into a generic actor category.*

The section therefore yields a plural subject architecture for theoretical dialogue. Economic theories can remain comparable without sharing a single subject ontology. The next analytical task is to examine the relations and structures through which those subjects interact, acquire positions, reproduce capabilities, coordinate action, and transform one another.

21.6 Economic Relations and Structural Configurations

The role of this section is to specify the relational and structural coordinates through which economic theories can be compared after their objects and subject architectures have been separated in Sections 21.4 and 21.5. Its objective is to distinguish a local relation between economic positions from a more persistent structure composed of patterned relations, and to show how different theoretical traditions assign explanatory weight to exchange, production, ownership, labor, institutions, care, networks, ecology, and power-bearing configurations. The section proceeds comparatively rather than by proposing that one relation is fundamental in every domain. Its method is to identify the positions connected by a relation, the mechanism carried by that relation, the temporal and institutional conditions of its reproduction, and the structural effects that arise when relations become patterned across multiple positions or periods.

Economic analysis often uses relational language while assigning different meanings to the relation itself. A market transaction can be represented as an exchange between already constituted agents, as an institutionally organized transfer of rights, as an event embedded in a continuing social relation, or as one moment in a wider structure of production and distribution. A firm can be represented through contracts, authority, routines, ownership, production relations, or network position. Care can appear as household allocation, unpaid labor, capability support, interdependence, or social reproduction. These descriptions are not interchangeable merely because each is relational. The analytical task is to identify what the relation connects, what passes through or is generated by it, which positions it creates or reproduces, and what remains outside the representation.

Definition 21.94 (Economic relational-structural profile). *An economic relational-structural profile specifies the positions connected within an economic configuration, the type and direction of relations among them, the resources, rights, information, obligations, capabilities, values, or dependencies mediated by those relations, their temporal persistence and institutional conditions, the larger pattern formed across relations, and the mechanisms through which that pattern affects subsequent action or position formation.*

The definition distinguishes relation from structure without making them independent objects. A relation is a typed connection or process between positions. A structure is a sufficiently persistent and patterned organization of multiple relations such that the pattern itself becomes relevant to the opportunities, constraints, expectations, dependencies, or positions generated within the configuration. Structural explanation therefore requires more than naming a pattern. It should identify how the pattern is reproduced and how it enters a mechanism relevant to the claim.

Proposition 21.95 (Relational-structural identification condition). *An economic relation or structure has explanatory content only where the relevant positions, relational mechanism, persistence conditions, and consequences for action, capability, distribution, or subsequent position formation can be identified with sufficient specificity for the local claim.*

Table 21.6 summarizes the ten relational coordinates developed below. The table is comparative rather than exhaustive: a concrete economic configuration can contain

Table 21.6: Relational and structural coordinates for cross-theoretical economic comparison.

Coordinate	Primary relational question	Characteristic reduction risk
Exchange	What is transferred, by whom, through which rights and terms?	Reducing continuing relations to isolated transactions
Production	How are heterogeneous inputs and contributions transformed into outputs and capacities?	Treating production as a technical mapping alone
Ownership	Which rights, control capacities, residual claims, and exclusion powers attach to positions?	Treating legal title as complete practical control
Labor	How are work, authority, remuneration, capability, and dependence organized?	Treating labor only as a priced input
Institution	How do rules, roles, procedures, and enforcement organize interaction?	Reifying rules apart from enactment and interpretation
Care	How are maintenance, dependence, capability support, and social reproduction organized?	Treating care as residual household activity
Network	How do topology and position condition access, mediation, diffusion, and dependence?	Treating edges as homogeneous connections
Ecology	How do economic processes depend on and transform biophysical relations?	Treating environment as an external stock
Power-bearing structure	Which relations convert asymmetry or dependence into durable control over relevant possibilities?	Inferring power directly from difference or centrality
Translation boundary	Which relational mechanisms correspond across theories, and which remain irreducible?	Equating shared vocabulary with structural identity

several of these relations simultaneously, and the analytical problem is often their coupling rather than the isolation of one relation.

21.6.1 Exchange Relations and Transfer Architecture

Exchange is among the most familiar relational objects in economics, yet theories differ over what an exchange relation contains. A minimal representation can connect two parties through quantities and prices. Broader representations can include property rights, contractual terms, information, bargaining position, institutional enforcement, reputation, repeated interaction, and the histories through which the objects of exchange became transferable. Smith's analysis of exchange and specialization situated market exchange within a wider architecture of production and social coordination (A. Smith 1776). Polanyi's historical account, by contrast, emphasizes that exchange operates through instituted economic arrangements whose social organization can vary substantially (Polanyi 1944; Polanyi 1957).

For theoretical dialogue, the key issue is therefore the *transfer architecture*. What is transferred can include a physical good, a service, a claim, access, risk, information,

a right of use, or a future obligation. Payment does not always exhaust the relation: warranties, employment obligations, platform dependence, continuing service provision, data extraction, or credit relationships can persist after the transaction event. Exchange can consequently be modeled as an event nested within a longer relation.

Definition 21.96 (Exchange-relation profile). An *exchange-relation profile* specifies the parties and positions participating in a transfer, the object or entitlement transferred, reciprocal or nonreciprocal consideration, relevant rights and obligations, pricing or valuation mechanism, information and bargaining conditions, enforcement architecture, temporal continuation, and dependencies that remain after the transfer event.

This profile allows price-centered and institution-centered accounts to be compared without demanding that they answer the same question. A spot-market model may be adequate for a claim about local price response while leaving continuing dependence outside its scope. A relational or institutional account may be required where the economic consequence depends on repeated exchange, locked-in infrastructure, incomplete contracting, or asymmetric exit capacity.

Proposition 21.97 (Exchange-scope condition). An *exchange representation is adequate to the extent that the transfer event and its retained obligations, dependencies, and institutional conditions include the relations causally relevant to the claim being evaluated.*

21.6.2 Production Relations and Cooperative Transformation

Production links heterogeneous contributions through processes that transform materials, knowledge, labor, energy, organization, infrastructure, and time. Treating production only as a technical mapping from inputs to outputs can be useful for some questions, but it can omit the relations through which inputs become available, coordinated, maintained, and renewed. Marx's analysis placed relations of production at the center of a broader account of class and accumulation (Marx 1867). Coase's theory of the firm, from a different analytical tradition, asked why some transactions are coordinated within firms rather than through market contracting (Coase 1937). The theories differ substantially, yet each makes the organization of production analytically consequential.

A relational comparison should distinguish technical complementarity from organizational cooperation, authority, ownership, contractual dependence, and capability reproduction. The same observed output can arise through different configurations: vertically integrated firms, decentralized contracting, cooperatives, platform-mediated work, public production, household production, or commons-based arrangements. These configurations can distribute learning, risk, control, maintenance burdens, and future productive capacity differently even when short-run output is similar.

Definition 21.98 (Production-relational profile). A *production-relational profile* identifies the contributing positions, materials and capabilities mobilized, transformation process, coordination and authority mechanisms, allocation of risk and returns, maintenance and learning requirements, temporal sequencing, and the effects of production on the future capacities of participating positions and infrastructures.

Production is therefore both transformative and potentially generative or depletive. It can produce goods while eroding ecological stocks, increase output while degrading worker capability, or generate learning that expands later productive possibilities. These effects need not be included in every production model, but theoretical translation should record whether they are represented or bracketed.

Proposition 21.99 (Production-configuration condition). *Two theories represent corresponding production relations only where their relevant transformation, coordination, contribution, and reproduction mechanisms can be mapped without treating equal output measures as sufficient evidence of structural equivalence.*

21.6.3 Ownership and Control Relations

Ownership organizes economically consequential relations through bundles of rights and recognized positions. Legal title can carry rights to use, exclude, transfer, receive income, modify, collateralize, or dispose of an asset, yet practical control can diverge from formal ownership. Creditors, managers, regulators, platform operators, technical administrators, communities, licensors, or infrastructure providers can possess forms of control that matter even where they lack title. Institutional economics has long emphasized that property is constituted through rules and enforceable claims rather than being a purely physical relation between a person and an object (Commons 1931; North 1990).

The distinction between ownership and control is especially important for contemporary intangible and infrastructural assets. A person can nominally own data while lacking practical capacity to move, interpret, or delete it; a firm can own equipment while depending on proprietary software or cloud infrastructure controlled elsewhere; shareholders can possess residual claims while managers exercise operational authority. Cross-theoretical comparison should therefore decompose the rights and capacities bundled into ownership.

Definition 21.100 (Ownership-control profile). *An ownership-control profile specifies the asset or relation governed, legal title, use rights, exclusion rights, transfer rights, income and residual claims, decision and modification authority, collateral or encumbrance relations, enforcement conditions, and practical dependencies that qualify the exercise of those rights.*

This profile prevents ownership from serving as a single scalar variable where the local mechanism depends on one component of the bundle. It also permits analysis of divided or layered control across jurisdictions, organizations, technical systems, and contractual relations.

Proposition 21.101 (Ownership-control decomposition condition). *Where an economic claim depends on control, access, exclusion, income, or transferability, ownership should be decomposed into the rights and practical capacities relevant to that mechanism rather than inferred solely from formal title.*

21.6.4 Labor Relations and Organizational Position

Labor relations connect productive contribution to remuneration, authority, time, skill formation, risk, identity, dependency, and organizational position. A wage can

be represented as the price of labor services for some analytical purposes, yet employment frequently includes continuing relations that exceed the wage transaction: supervision, scheduling, evaluation, promotion, training, occupational closure, benefits, legal protections, and dependence on organizational infrastructure. The economic object is therefore often a labor relation rather than a sequence of isolated labor-market exchanges.

Theories also differ over whether labor power, human capital, capability, class position, bargaining relation, care responsibility, or organizational membership provides the relevant explanatory object. These differences matter because identical wages can coexist with very different autonomy, security, learning, exposure, and future capacity. Labor relations can generate capabilities through training and collaboration or deplete them through deskilling, overwork, hazardous conditions, or unstable scheduling.

Definition 21.102 (Labor-relational profile). A *labor-relational profile* specifies the work contributed, remuneration and claims received, authority and scheduling relations, bargaining and exit conditions, legal and organizational standing, capability formation or depletion, risk allocation, temporal dependence, and the position of the worker within wider production and reproduction structures.

This definition also permits unpaid, informal, dependent, and hybrid forms of labor to enter comparison where they are economically consequential. The presence of remuneration can be one coordinate without serving as the sole criterion of economic contribution.

Proposition 21.103 (Labor-relation adequacy condition). A *labor representation is adequate for a given claim only where the dimensions of remuneration, authority, dependence, capability, and organizational position that transmit the relevant economic effect are included or explicitly bracketed.*

21.6.5 Institutional Relations and Rule-Structured Interaction

Institutions organize economic relations by stabilizing rules, roles, procedures, expectations, sanctions, entitlements, and recognized categories. Institutional relations therefore differ from ordinary repeated interaction: a role can carry authority or obligation because a rule system recognizes it. Commons, firms, markets, courts, public agencies, professional bodies, and payment systems all contain such rule-structured relations. Ostrom's work on commons governance demonstrates how positions, rules, monitoring, sanctions, and collective-choice arrangements can produce institutional diversity beyond a simple market-state dichotomy (Ostrom 1990; Ostrom 2005).

Rules, however, do not operate independently of interpretation and enactment. Written provisions can be weakly enforced, selectively applied, supplemented by informal norms, or transformed through precedent and administrative practice. The economic relation is therefore generated through the coupling of rule text, recognized roles, implementation capacity, interpretation, and participant expectations.

Definition 21.104 (Institutional-relation profile). An *institutional-relation profile* specifies the relevant rules, recognized positions, rights and duties, decision procedures, interpretation and enforcement mechanisms, informal complements,

monitoring and sanction pathways, revision procedures, and the historically reproduced expectations through which rule-structured interaction becomes economically consequential.

The profile makes institutions comparable without treating them as fixed containers. Institutional structure is reproduced through action and can change through reinterpretation, noncompliance, legal revision, organizational learning, or shifts in practical capacity.

Proposition 21.105 (Institutional-enactment condition). *An institutional explanation should connect formal or informal rules to the enactment, interpretation, enforcement, and expectation mechanisms through which those rules shape economic relations in practice.*

21.6.6 Care Relations and Reproductive Dependence

Care relations make visible forms of economic dependence that are easily obscured when analysis begins with self-sufficient actors. Children, older persons, disabled persons, patients, and temporarily dependent adults can require continuing care, while almost every economic subject depends at some stages of life on forms of maintenance, education, health support, emotional work, and social reproduction. Feminist economic analysis has emphasized that these activities are economically consequential even when they occur outside market exchange or formal employment (Folbre 1994; Folbre 2001).

Care is relational in a stronger sense than the transfer of a service. The quality and continuity of care can depend on knowledge of a particular person, trust, temporal presence, emotional relation, and responsibility that are only partially substitutable. Care providers can simultaneously hold capabilities and burdens, and the organization of care can redistribute time, income, labor-market participation, health, and future capability across households, communities, firms, and public institutions.

Definition 21.106 (Care-relation profile). *A care-relation profile identifies the care recipient and provider positions, dependency or support need, material and relational forms of provision, temporal continuity, substitutability, knowledge and trust requirements, compensation and recognition, burden distribution, institutional support, and effects on the capabilities of both recipient and provider.*

The purpose is not to assume that all care relations share one normative status. Some are voluntary, familial, professional, public, communal, or coercively allocated. Comparative analysis should preserve those differences while recognizing maintenance and reproduction as economic relations where they affect capability, participation, distribution, or institutional sustainability.

Proposition 21.107 (Care-reproduction condition). *Care enters economic structural analysis where its organization materially conditions the maintenance or reproduction of capabilities, participation, labor, health, or social continuity, with the distribution of care burdens and benefits kept analytically visible.*

21.6.7 Network Relations and Positional Topology

Network analysis emphasizes that economic consequences can depend on patterns of connection rather than attributes of isolated positions. Buyers and sellers, firms and suppliers, lenders and borrowers, researchers and collaborators, workers and referral contacts, or platforms and complementors can occupy positions whose significance arises from topology. Granovetter's account of embedded economic action illustrates how ongoing social relations can shape economic behavior beyond atomized transaction representations (Granovetter 1985).

A relational comparison should nevertheless resist treating every edge as equivalent. Connections can differ in direction, strength, frequency, content, substitutability, exclusivity, trust, contract, information quality, or control. Network centrality can improve access in one configuration while increasing exposure or mediation burden in another. A network representation is therefore informative only where the meaning of its nodes and edges remains tied to the economic mechanism under study.

Definition 21.108 (Economic network-structure profile). An *economic network-structure profile* specifies the economically meaningful nodes or positions, typed and directed relations among them, topology, concentration and redundancy, flows or transformations carried by relations, entry and exit conditions, temporal persistence, and the mechanisms through which network position affects access, diffusion, mediation, dependency, or resilience.

This profile also distinguishes topology from structure in the broader sense. A graph can represent patterned connectivity while omitting legal rules, organizational authority, or value processes that are constitutive of the economic relation. Network structure is therefore one representation of relational organization rather than a universal substitute for institutional analysis.

Proposition 21.109 (Network-semantic condition). A *network representation* has explanatory force only where node and edge semantics, relevant flow or transformation mechanisms, and the economic consequences of topology are specified rather than inferred from connectivity measures alone.

21.6.8 Ecological Relations and Biophysical Dependence

Economic configurations are embedded in biophysical processes that provide energy, materials, ecological services, waste absorption, climatic conditions, and regenerative capacities. Ecological economics has emphasized that economic production cannot be treated as materially closed because transformation is constrained by biophysical throughput and irreversibility (Georgescu-Roegen 1971; Daly 1990). Social-ecological research likewise shows that resource systems, users, governance arrangements, and ecological processes can be dynamically coupled (Ostrom 2009).

The relational issue is therefore more specific than adding an environmental variable to an otherwise unchanged economic model. Ecological relations can constitute the feasible production set, determine regeneration rates, create threshold effects, transmit risks across places and generations, and alter the distribution of economic opportunities. Economic actors can also transform the ecological relations on which

their later activity depends.

Definition 21.110 (Ecological-economic relation profile). *An ecological-economic relation profile specifies the biophysical system or process relevant to an economic claim, the economic positions dependent on or transforming it, material and energy flows, regeneration and depletion dynamics, spatial and temporal boundaries, thresholds or irreversibilities, governance relations, and the distribution of resulting benefits, burdens, and future constraints.*

This profile avoids treating ecology as an external stock while also avoiding the claim that every ecological process should be absorbed into economics. The economic relevance must be established through identifiable dependence, transformation, valuation, distribution, or institutional mechanism.

Proposition 21.111 (Ecological-embedding condition). *An ecological relation should enter an economic explanation where biophysical dependence or transformation materially alters the mechanism, feasible trajectories, distribution, or regenerative conditions relevant to the economic claim.*

21.6.9 Power-Bearing Relational Structures

Relations can carry asymmetries in resources, capabilities, information, legal authority, infrastructure access, exit options, or control over consequential interfaces. Such asymmetries can become power-bearing when the relational structure allows one position to alter another's practical possibilities, terms of participation, exposure, or capacity to contest. Section 21.5 distinguished subject agency from standing and affectedness. The present subsection identifies the structural carrier through which asymmetry can matter, while Section 21.10 will later compare theories of coordination and power in greater depth.

Power should not be inferred directly from difference. A large firm and a small firm can differ greatly in scale without the larger firm controlling a relation relevant to the smaller one. Network centrality, ownership, expertise, legal authority, or technological capability can likewise fail to convert into power where dependence is low, alternatives are available, or effective counter-capacity exists. The relational mechanism is therefore the conversion of a difference or positional advantage through dependency, control, mediation, or restricted alternatives.

Definition 21.112 (Power-bearing structural profile). *A power-bearing structural profile identifies the positions in an asymmetric relation, the resource, capability, rule, infrastructure, information channel, or interface through which asymmetry can be converted, the dependence and substitutability conditions of affected positions, the decisions or possibilities subject to alteration, temporal persistence, and available counter-capacity or contestation pathways.*

The profile is deliberately narrower than a general theory of power. Its purpose in theoretical dialogue is to distinguish relations that merely differ from relations whose structure transmits durable control over economically consequential possibilities.

Proposition 21.113 (Power-conversion condition). *A relational asymmetry should be interpreted as economically consequential power only where an identifiable dependence, control, or mediation pathway converts that asymmetry into altered possibilities, bur-*

dens, terms, or capacities for another position.

21.6.10 Structure–Relation Translation Boundaries

The preceding analyses show why relation and structure require their own translation discipline. Two theories can describe the same observed event while locating its causal significance in different relations. A wage payment can be represented as exchange, as part of a labor relation, as a class relation, as an institutional entitlement, as a node in household reproduction, or as one component of a production network. These representations can overlap without becoming interchangeable.

Translation should therefore proceed at the mechanism level. The comparison should ask whether the theories identify corresponding positions, whether the relation has the same directionality and temporality, whether it carries the same rights, obligations, resources, or dependencies, whether the surrounding structural pattern plays a causal role, and whether relation-induced changes in the positions themselves are represented. A shared relational vocabulary can organize these questions while preserving irreducible differences.

Definition 21.114 (Structure–relation translation profile). A *structure–relation translation profile* maps theoretical representations across position definitions, relation type, directionality, relational content, temporal persistence, institutional embedding, topology, constitutive effects, structural reproduction, and associated dependence or control, while recording dimensions for which correspondence remains partial or absent.

This profile also separates structural correspondence from equivalence. A network theory and an institutional theory can identify a similar concentration pattern while disagreeing about why it persists. A Marxian and a contractual account can both analyze the firm while assigning different causal roles to ownership, production, authority, class, and exchange. A care-economic and capability approach can overlap on dependence and capability maintenance while retaining different normative and explanatory commitments. The comparative gain lies in locating these correspondences and disagreements precisely.

Proposition 21.115 (Structure–relation translation condition). *Cross-theoretical relational translation is adequate only where correspondence is established for the mechanisms relevant to the claim and where differences in relation type, structural reproduction, constitutive effect, temporal scope, or power-bearing capacity remain explicit rather than being absorbed into a generic concept of connection.*

Economic theories can therefore share a relational coordinate system without sharing one structural ontology. Exchange, production, ownership, labor, institutions, care, networks, ecology, and power-bearing relations can intersect within the same economic configuration while retaining different explanatory roles. Section 21.7 next applies the same non-reductive dialogue method to value and commensuration, where structural translation becomes especially demanding because theories differ not only over relations but also over what can legitimately be compared, aggregated, priced, or left incommensurable.

21.7 Economic Value and Commensuration Architectures

The role of this section is to provide a comparative architecture for theories that use the language of value while assigning different objects, mechanisms, evidential roles, and evaluative purposes to that language. Its objective is to distinguish value carrier, value formation or realization, measurement, comparison, commensuration, aggregation, conversion, normative ranking, and unresolved remainder. The discussion proceeds through utility, labor-based value, price, capability, care, ecological, relational, and generative approaches before examining commensuration and incommensurability directly. The method is comparative and non-reductive. Each approach is reconstructed through the problem it addresses and the information it treats as relevant, while translation is limited to dimensions for which correspondence can be established without converting heterogeneous value claims into one presumed common metric.

Economic theories often appear to disagree over “value” while addressing different analytical questions. A utility representation can organize preference-based choice without claiming to describe labor contribution. A labor theory can analyze social production without supplying a complete welfare metric. A price can coordinate exchange without measuring every relevant form of worth. Capability evaluation can assess substantive opportunity without reducing opportunity to willingness to pay. Care, ecological, relational, and generative approaches can identify contributions or conditions that remain only partially represented in conventional monetary accounts. Theoretical dialogue therefore requires more than asking which theory has the correct quantity of value. It requires identifying what is being valued, by whom or through which process, for which purpose, through what evidence, and with what comparison rule.

Definition 21.116 (Economic value-architecture profile). An *economic value-architecture profile* specifies the value carrier or evaluative object, the subject or process through which value is attributed, formed, realized, or recognized, the mechanism connecting the carrier to the evaluative claim, the informational basis, the available measurement or ordering procedure, the relevant scale and time horizon, the institutions or interfaces through which value becomes consequential, the permitted forms of comparison or aggregation, and any value remainder that the representation leaves unresolved.

The profile separates analytical operations that are often compressed into one vocabulary. Measurement assigns observations according to a rule. Comparison establishes some relation among alternatives. Commensuration expresses heterogeneous entities through a common metric. Aggregation combines values across units according to an explicit procedure. Conversion transforms one value-bearing condition into another form or representation. Normative ranking specifies which states, distributions, or relations count as better according to a criterion. One operation can occur without the others.

Proposition 21.117 (Value-operation separation condition). *Cross-theoretical value comparison is adequate only where measurement, comparison, commensuration, aggregation, conversion, and normative ranking are distinguished whenever their identification would alter the interpretation, evidential warrant, or practical consequence of*

Table 21.7: Value and commensuration coordinates for cross-theoretical economic dialogue.

Coordinate	Primary evaluative question	Characteristic reduction risk
Utility	How are alternatives ordered relative to preferences or welfare representations?	Treating preference representation as complete value theory
Labor-based value	How does socially organized labor enter value formation and distribution?	Treating labor magnitude as a universal welfare metric
Price	How are exchange ratios and monetary valuations formed and used?	Treating price as exhaustive social worth
Capability	What substantive opportunities are practically available to persons?	Treating observed functioning as complete capability
Care	How are maintenance, dependence, and reproductive contribution valued?	Treating care as a homogeneous service quantity
Ecological value	Which biophysical stocks, functions, relations, and regenerative conditions matter?	Treating ecological value as fully substitutable monetary capital
Relational value	What value arises through the quality or form of relations?	Treating relations as attributes of isolated goods
Generative value	How do present processes alter later capacities and value-producing conditions?	Treating future production of possibility as automatically good
Commensuration	Which entities can be represented through a common metric, for which purpose?	Treating a common metric as proof of substantive equivalence
Value remainder	Which evaluative differences remain outside a justified common scale?	Treating incomplete comparison as decision impossibility
Translation	Which value dimensions correspond across theories without erasing remainder?	Treating partial correspondence as theoretical identity

the claim.

Table 21.7 summarizes the eleven comparative coordinates developed below. The categories are neither mutually exclusive nor exhaustive. Their purpose is to preserve the distinctive analytical work performed by different value architectures while making points of partial correspondence visible.

21.7.1 Utility-Based Valuation

Utility has performed several different roles across economic theory: a language of satisfaction, a representation of preference ordering, an argument about welfare, and a formal device for representing choice. Historical marginalism did not contain one uniform theory of utility. Jevons treated marginal utility as central to exchange, while Pareto and later ordinal approaches reduced the dependence of consumer theory on measurable cardinal pleasure (Jevons 1871; Pareto 1971; Hicks 1939b). The comparative task therefore begins by identifying what status utility has in the theory

being examined.

In an ordinal choice representation, a utility function can encode the ordering of alternatives without implying that differences in utility have interpersonal or even intrapersonal cardinal meaning. In other applications, expected utility or welfare analysis can assign additional structure. These uses should remain separated because a mathematical representation adequate for predicting choice need not provide a complete account of well-being, justice, or social value. Sen's critique of informationally narrow welfare evaluation is especially relevant: satisfaction or preference can adapt to persistent deprivation, while substantive freedom can remain constrained (Sen 1992; Sen 1999).

Definition 21.118 (Utility-valuation profile). A *utility-valuation profile* specifies whether utility represents experienced satisfaction, preference ordering, choice consistency, expected evaluation under uncertainty, welfare, or another object; whether the representation is ordinal or cardinal; the domain over which preferences are defined; the information excluded from the representation; and the comparison or aggregation operations for which the utility representation is claimed to be valid.

Utility therefore supplies a highly productive coordinate for theoretical dialogue when its informational role remains explicit. A preference ordering can be compared with capability or relational approaches at the point where each asks how alternatives are evaluated, while disagreement remains visible over whether the evaluative basis should include adaptation, social relations, rights, capability, or future generative effects.

Proposition 21.119 (Utility-scope condition). A *utility representation supports a broader value claim only to the extent that the informational interpretation, interpersonal-comparison assumptions, and normative role required by that broader claim are independently specified and justified.*

21.7.2 Labor-Based Value Formation

Labor-based theories of value address a different problem. Classical political economy connected value to production, labor, cost, exchange, and distribution, while Marx located the value form within historically specific relations of commodity production and socially necessary labor (A. Smith 1776; Marx 1867). These accounts cannot be translated into utility language simply by treating labor as another preference-bearing attribute. Their principal analytical object concerns the social organization through which production and exchange acquire determinate value relations.

For theoretical comparison, several dimensions should be separated: embodied or expended labor, socially necessary labor time, labor contribution, labor cost, bargaining power, remuneration, and moral claims about deservingness. These dimensions can overlap in historical debates but need not coincide. A claim that labor participates in value formation is distinct from a claim that wage income measures labor's full social contribution, and both differ from a normative claim that distribution should track labor contribution.

Definition 21.120 (Labor-value formation profile). A *labor-value formation profile* specifies the relevant form of labor, the social and technical organization of produc-

tion, the mechanism connecting labor to the value claim, the treatment of productivity and heterogeneity, the relation between value and exchange magnitude, the institutional conditions of realization, and the distributional or normative conclusions, if any, that are claimed to follow.

This profile makes labor-based and other theories comparable without requiring a common scalar representation. A capability analysis can ask what labor arrangements do to substantive opportunities; a care analysis can identify socially necessary reproductive labor omitted from market accounts; a price theory can examine monetary remuneration. These are intersecting questions whose answers can diverge because they refer to different value objects.

Proposition 21.121 (Labor-value translation condition). *A labor-based value claim should be translated into another value architecture only where the labor object, production mechanism, social form, and relevant realization conditions survive the translation rather than being replaced by a different evaluative object carrying the same word “value.”*

21.7.3 Price-Based Valuation Signals

Price is among the most observable and institutionally consequential forms through which economic valuation appears. Prices can coordinate exchange, transmit information, structure incentives, establish accounting values, determine eligibility or affordability, and influence investment. They arise through specific market and institutional configurations involving supply, demand, bargaining, regulation, market power, conventions, and monetary arrangements. Marshall’s treatment of market value through interacting demand and supply conditions already illustrates why price should not be identified with a one-sided theory of value (Marshall 1890).

A price can nevertheless perform several distinct functions. It can be an exchange ratio, an administered rule, an accounting convention, an auction outcome, a regulated tariff, a shadow price, or a willingness-to-pay estimate. These objects possess different evidential and normative meanings. Market price can reveal a consequential relation among participants under existing conditions while remaining silent about people excluded from the market, future generations, nonmarket care, ecological thresholds, rights, or values deliberately withheld from sale.

Definition 21.122 (Price-valuation profile). *A price-valuation profile specifies the priced object or entitlement, the institution through which the price is formed, participating and excluded positions, the information and bargaining conditions, monetary unit and time horizon, relevant constraints on exchange, the behavioral or accounting function of the price, and the scope of any inference from price to welfare or social value.*

Price therefore offers a commensurating interface without establishing substantive equivalence. Two goods can receive the same monetary price while differing in ecological consequence, care burden, capability effect, symbolic meaning, or future generativity. Conversely, an unpriced good can remain economically consequential through institutions, dependence, maintenance, or foregone alternatives.

Proposition 21.123 (Price-warrant condition). *A monetary price warrants a claim*

about exchange valuation within the relevant institutional configuration; any extension from that price to comprehensive welfare, social worth, ecological value, or normative priority requires additional assumptions and evidence.

21.7.4 Capability-Based Evaluation

Capability-oriented evaluation shifts the informational basis from resources or utility alone toward the substantive opportunities persons possess to achieve valuable beings and doings (Sen 1985; Sen 1992; Robeyns 2005). The relevant value carrier is therefore neither a commodity bundle nor a reported satisfaction level. It is an opportunity structure whose practical availability depends on personal, social, institutional, and environmental conversion conditions.

This architecture complicates commensuration. Capabilities are multidimensional, partly counterfactual, and sensitive to the purpose of evaluation. Two persons can display the same achieved functioning while possessing different opportunity sets; two persons with the same resources can possess different capabilities. Operationalization can use indicators and explicit weights, but the existence of a multidimensional index does not demonstrate that the underlying capabilities are intrinsically commensurable or that the chosen weights are normatively neutral.

Definition 21.124 (Capability-evaluation profile). *A capability-evaluation profile specifies the persons or positions evaluated, relevant capabilities and functionings, resources and conversion conditions, substantive alternatives, evidence used to infer opportunity, weighting or comparison procedures, participatory or normative basis for selecting dimensions, and the remainder between observed achievement and practical freedom.*

For GRE dialogue, capability analysis provides a particularly important bridge to access, conversion, action space, and future possibility. The relationship remains non-identical. GRE generativity concerns how present processes alter later value-producing and capability-producing conditions, while capability evaluation can assess substantive opportunities without adopting a generative ontology or temporal architecture.

Proposition 21.125 (Capability-comparison condition). *A capability comparison is adequate only where the relevant dimensions, conversion conditions, informational proxies, weighting procedure, and distinction between achieved functioning and substantive opportunity are sufficiently explicit for the evaluative purpose.*

21.7.5 Care Value in Reproductive Relations

Care-economic traditions draw attention to activities and relations that maintain persons, households, communities, and social reproduction while being incompletely represented by wages, national accounts, or market prices. Feminist economic work has shown how unpaid household and care labor can disappear from conventional accounting despite its economic indispensability (Waring 1988; Folbre 1994). Care work can also occur in paid markets, where its valuation is shaped by gendered institutions, public-good characteristics, emotional relations, and constraints on substitution (England 2005).

Care value is especially resistant to simple unitization because the service output can depend on continuity, trust, attentiveness, relational knowledge, responsibility, and the condition of the recipient. Time-use measures can make labor visible, wages can record remuneration, and replacement-cost estimates can construct monetary proxies. Each representation answers a different question. None automatically exhausts the value of sustaining capability, reducing vulnerability, or preserving a relationship through which care can be effectively delivered.

Definition 21.126 (Care-value profile). A *care-value profile* specifies the care relation, recipient and provider positions, maintenance or capability function, paid or unpaid institutional setting, time and intensity, relational continuity, substitutability, burdens and opportunity costs, remuneration or accounting representation, and evaluative remainder not captured by the selected measure.

Care therefore illustrates why recognition and commensuration should be separated. Making unpaid care visible through a monetary estimate can correct one accounting omission while still leaving relational and qualitative dimensions outside the metric. A translation is analytically useful where it makes a hidden burden or contribution comparable for a defined purpose, provided the comparison does not redefine the original relation as merely a priced service.

Proposition 21.127 (Care-valuation remainder condition). A *care valuation* should preserve a remainder whenever the chosen time, wage, replacement-cost, capability, or outcome measure omits relational continuity, dependency, quality, responsibility, or another dimension material to the claim being evaluated.

21.7.6 Ecological Value in Biophysical Reproduction

Ecological value architectures address stocks, processes, functions, relations, regenerative capacities, and thresholds that condition economic possibility. Ecological economics has emphasized the material and energetic irreversibility of economic processes and the importance of maintaining regenerative conditions (Georgescu-Roegen 1971; Daly 1990). Environmental valuation can use monetary estimates for particular decisions, while other approaches emphasize intrinsic, relational, ecological, or sustainability-based reasons for preservation.

The comparative problem concerns what exactly becomes commensurated. A monetary estimate of an ecosystem service can support a policy comparison without establishing that the ecosystem is exhaustively represented by the estimate. Natural-capital measures can make depletion visible while embedding assumptions about substitutability. Thresholds, irreversibility, species loss, identity, stewardship, and future ecological function can remain only partially represented by present willingness to pay.

Definition 21.128 (Ecological-value profile). An *ecological-value profile* specifies the ecological entity, process, relation, or regenerative condition evaluated; the affected human and nonhuman positions where relevant; spatial and temporal scale; biophysical dependencies and thresholds; measurement indicators; monetary or nonmonetary valuation procedure; substitutability assumptions; uncertainty; and dimensions intentionally retained outside the chosen metric.

Ecological value can therefore interact with price, capability, relational, and generative value without becoming reducible to any one of them. A wetland can carry market-related service values, support capabilities, participate in cultural and relational values, and preserve future regenerative capacity. These dimensions can inform one decision while requiring different forms of evidence and comparison.

Proposition 21.129 (Ecological-commensuration scope condition). *An ecological commensuration procedure is warranted only for the decision dimensions it validly represents; biophysical thresholds, irreversibilities, non-substitutable relations, and long-horizon regenerative conditions should remain explicit where their omission would change the decision or interpretation.*

21.7.7 Relational Value Formation

Relational value identifies cases in which the quality, form, or appropriateness of a relation contributes to what is valuable. Environmental scholarship has used relational value to describe values grounded in relationships, responsibilities, identities, and ways of living with human and nonhuman others (Chan et al. 2016). Relational-goods traditions similarly examine goods whose value depends on interpersonal interaction and cannot be produced or consumed entirely by isolated individuals (Uhlener 1989; Gui 2000).

A relational-value architecture differs from attaching an ordinary attribute to a good. Trust, reciprocity, recognition, belonging, mutuality, or shared participation can depend on how interaction occurs. Replacing a relationship with an apparently equivalent monetary transfer can therefore alter the value-bearing object itself. This does not imply that relational values are inherently nonmarket or normatively superior. Market exchange can sustain relationships, and relational forms can reproduce exclusion or domination. The analytical requirement is to identify the relation that carries the value and the mechanism through which that value is realized.

Definition 21.130 (Relational-value profile). *A relational-value profile specifies the participating positions, the relation or mode of association carrying evaluative significance, the practice or condition through which the value is realized, temporal persistence, dependence on reciprocity or recognition, possible institutional mediation, substitutability, and the extent to which monetary or scalar representations preserve or alter the value-bearing relation.*

Relational value can be compared with utility where participants value the relation, with capability where relations expand substantive opportunity, and with care where relational continuity matters. Those correspondences remain partial because the explanatory object can differ: experienced satisfaction, substantive freedom, care contribution, and the value of the relationship itself should remain distinguishable.

Proposition 21.131 (Relational-value preservation condition). *A translation of relational value is adequate only where the representation preserves the economically relevant properties of the relation whose form or quality carries the value, rather than retaining only an outcome associated with that relation.*

21.7.8 Generative Value Formation

Generative value directs attention toward processes that create or regenerate conditions through which later value, capability, knowledge, participation, or economic possibility can arise. GRE inherits important precedents from work on generative value while developing a broader architecture of heterogeneous value generation, conversion, circulation, capture, return, dissipation, and regeneration (Eglash 2016). Within the present chapter, generative value is included as one value architecture among others rather than as a common metric into which the other architectures should be translated.

The distinctive temporal object is a change in later possibility. Education can contribute to future capability; research can generate knowledge whose applications are initially unknown; infrastructure can alter future coordination; ecological restoration can regenerate future material possibility; institutions can reproduce trust or procedural capacity. These processes differ materially. Their common feature is only that part of their economic significance concerns the conditions they generate for subsequent value-bearing activity.

Definition 21.132 (Generative-value profile). *A generative-value profile specifies the present process, the later value-bearing capacities or conditions whose formation is claimed, the transmission or reproduction mechanism, affected positions, temporal horizon, dependencies and complementary conditions, evidence connecting present action to later possibility, distribution of generative benefits and burdens, and any depletion or foreclosure produced alongside generation.*

Generative value is descriptively compatible with normatively adverse outcomes. A process can generate durable extractive capacity, dependency, or exclusion. Normative evaluation therefore requires further criteria concerning whose capabilities or possibilities are generated, which values are served, which burdens are imposed, and what alternatives are foreclosed.

Proposition 21.133 (Generative-value separation condition). *Evidence that a process generates future value-producing capacity or possibility establishes a generative effect within the specified domain; normative desirability, distributive justice, and equivalence with other value forms require additional evaluative premises.*

21.7.9 Commensuration Procedures

Commensuration converts qualities or entities that differ in kind into a representation through which they can be compared using a common metric. Espeland and Stevens emphasize that commensuration is a social process with cognitive and political consequences rather than a purely technical act (Espeland and Stevens 1998). Monetary valuation is one important form, but scores, rankings, indexes, quality-adjusted units, standardized tests, ratings, and composite indicators can perform similar comparative work.

Commensuration can generate substantial analytical and institutional benefits. A common unit can make trade-offs visible, coordinate decentralized decisions, support budgeting, identify disparities, or permit statistical analysis across heterogeneous cases. The same operation can also suppress distinctions that matter to the decision.

The relevant question is therefore neither whether commensuration is intrinsically valid nor whether qualitative difference forbids quantification. It is whether the selected metric preserves the distinctions required by the purpose for which comparison is undertaken.

Definition 21.134 (Commensuration procedure profile). A *commensuration procedure profile* specifies the heterogeneous entities being compared, the common metric or ordering rule, transformation from source attributes into the metric, weighting or normalization procedure, institutional purpose, included and excluded positions, sensitivity to scale and time, uncertainty, and the substantive distinctions lost or altered through commensuration.

A common metric can itself reshape the objects being measured. Rankings, scores, or monetary valuations can influence organizational priorities, participant behavior, and resource allocation, thereby making valuation performative in some settings (Espeland and Sauder 2007). The consequences of commensuration are therefore part of its economic analysis where the measure enters incentives or institutional decisions.

Proposition 21.135 (Purpose-indexed commensuration condition). A *commensuration rule* is adequate only relative to a stated evaluative or decision purpose and only where the transformations, weights, exclusions, and resulting loss of distinction remain acceptable for that purpose.

21.7.10 Incommensurable Value Remainders

Value plurality does not guarantee complete comparability. Philosophical work on incommensurability and incomparability distinguishes cases in which alternatives cannot be represented adequately by one common measure or complete ranking (Raz 1986; Chang 1997). Economic decision, however, often still has to proceed. The analytical problem is therefore to preserve the unresolved value relation while identifying the procedural or institutional basis on which action is nevertheless chosen.

Several forms of remainder should be distinguished. A *measurement remainder* exists where a valued dimension is recognized but poorly observed. A *metric remainder* exists where a dimension can be observed but does not translate appropriately into the selected common unit. A *normative remainder* exists where disagreement concerns the legitimate criterion or weighting. A *relational remainder* exists where the mode of valuation changes the relation being valued. A *temporal remainder* exists where future or irreversible consequences resist stable present comparison. These remainders differ from mere data scarcity.

Definition 21.136 (Incommensurable value-remainder profile). An *incommensurable value-remainder profile* records value dimensions recognized as material to an economic decision but not adequately represented within the selected common metric or ordering, the reason for the non-representation, affected positions, decision consequences, available partial comparisons, and the procedure through which unresolved plurality is carried into judgment or governance.

Incommensurability therefore need not imply paralysis. Rights can function as side constraints, thresholds can protect ecological or capability minima, deliberation can address plural values, and decisions can preserve options where uncertainty is

high. Such procedures do not manufacture a latent common metric. They provide ways to act while acknowledging incomplete evaluative closure.

Proposition 21.137 (Remainder-preservation condition). *Where a materially relevant value dimension lacks a justified common metric, an economic decision procedure should preserve that remainder explicitly rather than treating its absence from the metric as evidence of zero value or complete comparability.*

21.7.11 Translation across Value Architectures

The preceding architectures can overlap without becoming interchangeable. Utility and price can be linked through demand while remaining distinct. Labor can affect price without price becoming a complete representation of labor-based value. Capability can be supported by care, ecological conditions, income, or relational goods without being reducible to any of those inputs. Generative value can arise through capability formation, ecological regeneration, institutional learning, or relational reproduction while retaining a distinct temporal question. Cross-theoretical dialogue therefore requires translation across structured differences rather than a search for one master unit.

A useful translation begins by identifying the value carrier in each theory, the mechanism of realization, the informational basis, the subject or position whose evaluation matters, the scale and time horizon, and the comparison operation the theory permits. Correspondence can then be stated dimension by dimension. One theory can supply information omitted by another; two theories can provide alternative representations of the same process; or they can address different evaluative objects despite using the same term.

Definition 21.138 (Cross-theoretical value-translation profile). *A cross-theoretical value-translation profile maps two or more value architectures across carrier, valuer or affected position, formation or realization mechanism, informational basis, measurement, comparison rule, commensuration status, aggregation, temporal scope, institutional interface, normative role, and unresolved remainder, while distinguishing correspondence, complementarity, conflict, and absent translation.*

The profile also clarifies the place of conversion. A market can convert labor, access, information, or ecological use rights into monetary value; an institution can convert credentials into employment eligibility; a social process can convert recognition into trust or participation. Conversion demonstrates an operative interface between value forms. It does not establish that the source and target values are identical, conserved, or fully reversible. This distinction connects the theoretical dialogue of the present section to GRE's earlier treatment of typed value conversion and conversion remainder.

Proposition 21.139 (Value-translation non-reduction condition). *Cross-theoretical value translation is adequate only where correspondence is asserted at the level actually supported by shared mechanism or evaluative function, and where differences in carrier, information, commensuration, aggregation, temporal scope, normative role, or remainder remain available for subsequent analysis.*

Economic value can therefore be plural without becoming analytically unstruc-

tured. Utility, labor-based value, price, capability, care, ecological value, relational value, and generative value provide different coordinates for economic inquiry, and commensuration can create useful common representations for defined purposes. Theoretical dialogue becomes more rigorous when a common metric is treated as an instrument with a domain of validity rather than as evidence that heterogeneous value forms have become identical. Section 21.8 next extends this discipline to scarcity, resources, distribution, and allocation, where the meaning of scarcity itself depends on which value-bearing objects, access relations, and future possibilities are recognized.

21.8 Economic Scarcity–Access–Distribution Architecture

The role of this section is to provide a common comparative architecture for theories that organize economic analysis around scarcity, resources, access, distribution, and allocation while assigning different meanings to those terms. Its objective is to distinguish physical limitation from positional rivalry, institutional exclusion, attention constraint, knowledge access, capability limitation, generative opportunity, distributional incidence, and allocation authority. The discussion proceeds from resource conditions to institutional and cognitive forms of scarcity, then to distribution and allocation, and finally to the relational consequences through which scarcity can be reproduced, relocated, intensified, or relaxed. The method is comparative and mechanism-sensitive. A condition counts as scarce only relative to a specified subject, use, time horizon, institutional arrangement, and conversion pathway; the existence of scarcity therefore does not by itself identify either its cause or the appropriate allocation rule.

Scarcity is among the most influential organizing concepts in economics. Robbins famously characterized economic analysis around relations between ends and scarce means with alternative uses (Robbins 1932). Yet the word can refer to substantially different economic conditions. A material input can be physically limited; access to an abundant resource can be institutionally restricted; a position can be valuable because only a few participants can occupy it; information can be abundant while attention becomes scarce; knowledge can be costly to produce but inexpensive to reproduce; and nominal resources can coexist with severe capability deprivation when persons lack the conversion conditions required to use them. Treating these situations as one undifferentiated scarcity problem obscures the mechanisms through which economic constraints are produced and reproduced.

Definition 21.140 (Economic scarcity–access–distribution profile). An *economic scarcity–access–distribution profile* specifies the resource, position, capability, information, or opportunity at issue; the subjects for whom it is scarce or abundant; the physical, institutional, cognitive, relational, or temporal mechanism producing the constraint; the access and conversion conditions; the allocation authority or process; the resulting distribution; the relevant time horizon; and the pathways through which the arrangement reproduces, relaxes, transfers, or relocates scarcity.

This profile separates three analytical questions. A *resource condition* concerns what is available and reproducible. An *access condition* concerns which positions

Table 21.8: Scarcity, access, and distribution coordinates for cross-theoretical economic dialogue.

Coordinate	Comparative question	Characteristic reduction risk
Material scarcity	Which physical stocks, flows, regenerative processes, and substitutable inputs constrain feasible activity?	Treating every constraint as a fixed natural limit
Relative scarcity	Which positions or goods are scarce because their value depends on relative location, rank, congestion, or exclusivity?	Treating positional rivalry as material shortage
Institutional scarcity	Which rules, rights, classifications, or control arrangements restrict practical access?	Treating institutionally produced exclusion as natural scarcity
Attention	How is finite cognitive and organizational attention allocated among abundant signals and claims?	Treating information provision as equivalent to attention
Knowledge access	How are knowledge production, reproducibility, exclusion, verification, and absorptive capacity organized?	Treating inexpensive copying as universal practical abundance
Capability constraint	Which conversion conditions limit the use of available resources and formal opportunities?	Treating resource possession as substantive capability
Generative opportunity	Which present arrangements preserve or deplete future capacity to create options, relations, and value?	Treating current abundance as sufficient future opportunity
Distribution	How are resources, burdens, claims, positions, capabilities, and risks distributed across subjects?	Treating aggregate totals as distributionally sufficient
Allocation	Through which mechanisms and authorities are scarce or contested items assigned among uses and subjects?	Treating one allocation mechanism as universally adequate
Relational reproduction	How do allocation and distribution reshape later scarcity, access, dependency, and generativity?	Treating allocation as a terminal rather than history-producing event

can command or practically use what is available. A *distributional condition* concerns how resources, burdens, positions, capabilities, and opportunities are arranged across subjects. These dimensions can move independently. Aggregate abundance can coexist with restricted access, while equal nominal distribution can coexist with unequal conversion into substantive capability.

Proposition 21.141 (Scarcity-mechanism identification condition). *A scarcity claim supports an explanatory or policy conclusion only where the relevant scarcity mechanism, affected subjects, access conditions, conversion pathways, allocation process, and temporal horizon are specified at the level required by that conclusion.*

Table 21.8 summarizes the ten coordinates developed below. The table treats scarcity as a family of mechanisms rather than a single scalar condition.

21.8.1 Material Resource Scarcity

Material resource scarcity concerns physical stocks, flows, capacities, and regenerative processes that constrain feasible economic activity. Land, energy, minerals, water, biomass, housing space, transport capacity, and ecological sinks can become scarce through limited stocks, bounded flow rates, spatial concentration, depletion, congestion, or slow regeneration. This form of scarcity is closest to the intuitive image of “not enough” material means, yet even here the relevant boundary is relational. A resource can be abundant for one use and scarce for another, locally accessible but globally plentiful, or physically present while unavailable within the time horizon required by an economic process.

Economic analysis therefore benefits from separating absolute physical limits from scarcity generated by technology, infrastructure, substitution possibilities, quality requirements, and temporal mismatch. A mineral deposit that exists geologically may remain economically inaccessible. Electricity generation capacity may be sufficient annually while peak-load capacity is scarce hourly. Ecological systems can provide renewable flows while becoming scarce when extraction exceeds regeneration. Social-ecological analysis consequently links resource units, resource systems, users, and governance rather than treating biophysical quantity as the complete economic object (Ostrom 2009).

Definition 21.142 (Material resource-scarcity profile). *A material resource-scarcity profile specifies the physical stock or flow, spatial boundary, quality requirements, extraction or access technology, rate of use, regeneration or replenishment dynamics, substitutability, critical thresholds, and time horizon through which material availability constrains an economic process.*

Material scarcity can therefore change without a change in aggregate physical stock. Infrastructure can enlarge practical availability; degradation can reduce usable quality; substitution can move demand to another resource; and conservation can preserve future flows. Conversely, a technological increase in extraction capacity can relax near-term scarcity while accelerating later depletion.

Proposition 21.143 (Material-scarcity temporality condition). *A material-scarcity claim is incomplete where current availability is assessed independently of the extraction, replenishment, substitution, degradation, and threshold processes that determine availability over the relevant economic horizon.*

21.8.2 Positional and Relative Scarcity

Some economic goods or positions remain scarce even when their material substrate becomes abundant because their value depends on relative position, exclusivity, congestion, status, or limited occupancy. Central urban locations, elite credentials, high-ranking offices, spectrum slots, queue priority, exclusive memberships, and certain attention-generating positions have this structure. Additional material production can sometimes relax the constraint, but it cannot automatically reproduce the relational position being sought.

Relative scarcity is therefore generated by a comparison relation or occupancy structure. The relevant object is not merely the good but the relation between a po-

sition and the surrounding distribution. A larger supply of credentials, for example, can increase educational attainment while leaving scarcity of high-status differentiation intact if the relevant evaluative hierarchy moves with the distribution. A larger number of communication channels can expand expression while intensifying competition for visibility.

Definition 21.144 (Relative-scarcity profile). A *relative-scarcity profile* specifies the scarce position or comparative advantage, the reference population, the ordering or congestion relation that generates scarcity, the number or proportion of positions practically available, the conditions of entry and exit, and the mechanisms through which expansion, substitution, or reclassification changes the relational value of the position.

This distinction matters because policies directed at material supply can fail when the binding constraint is positional. Building more physical space can relieve congestion but may leave prestige-based location scarcity intact. Expanding formal credentials can increase knowledge while also creating new differentiating credentials. The theoretical task is to identify which relation is scarce before assuming that greater quantity relaxes it.

Proposition 21.145 (Relative-scarcity non-substitution condition). *An increase in the material quantity associated with a positional good relaxes the relevant scarcity only where the comparative, congestion, rank, or exclusivity relation generating that scarcity is correspondingly altered.*

21.8.3 Institutionally Produced Scarcity

Scarcity can also be produced by rules, rights, classifications, contracts, administrative procedures, intellectual-property regimes, zoning, licensing, platform access conditions, or control over infrastructure. In such cases, a resource may be materially available while practical access is restricted. Polanyi's treatment of economies as instituted processes is useful here because exchange and distribution occur through historically specific institutional arrangements rather than through a mechanism detached from law and social organization (Polanyi 1957).

Property-rights analysis similarly shows why ownership should not be represented as a single binary relation. Access, withdrawal, management, exclusion, and alienation can be distributed among different positions (Schlager and Ostrom 1992). Scarcity for a particular subject may therefore arise because that subject lacks one right in a differentiated bundle, even when another subject can use the same underlying resource. Sen's entitlement analysis makes a related point in the context of famine: aggregate availability and individual command over food can diverge because access depends on production, exchange, and institutional entitlements (Sen 1981).

Definition 21.146 (Institutionally produced scarcity profile). An *institutionally produced scarcity profile* specifies the materially available resource or opportunity, the rule or rights architecture governing it, the positions authorized to access or control it, the procedures and costs of qualification, the enforcement mechanism, the available substitutes, and the revision pathways through which the institutional restriction can change.

Institutionally produced scarcity is not inherently inefficient or illegitimate. Safety standards, conservation rules, professional licensing, privacy protections, and ecological restrictions can deliberately limit access in order to preserve other values or future capacities. The analytical requirement is therefore to distinguish the existence of an institutional restriction from the evaluation of its purpose and effects.

Proposition 21.147 (Institutional-scarcity attribution condition). *Where material availability exceeds practical access, an explanation of scarcity should identify the institutional mechanism governing qualification, authorization, exclusion, control, or enforcement before attributing the constraint to physical shortage alone.*

21.8.4 Attention Allocation under Informational Abundance

Information-rich environments illustrate a different scarcity architecture. Simon observed that an abundance of information consumes the attention of its recipients and therefore creates a need to allocate scarce attention among abundant information sources (Simon 1971). Digital networks, scientific publishing, financial information systems, organizational dashboards, and AI-generated content intensify this structure: storage and transmission can become inexpensive while human or organizational capacity to inspect, verify, interpret, and act remains bounded.

Attention scarcity is not simply a psychological property of isolated individuals. Interfaces, ranking systems, workflows, notification architectures, organizational roles, deadlines, and incentive structures distribute attention. A platform can increase informational abundance while concentrating visibility. An organization can collect more indicators while reducing the time available for interpreting each one. AI can lower the cost of producing analyses while increasing the verification burden placed on decision makers.

Definition 21.148 (Attention-allocation profile). *An attention-allocation profile specifies the available information streams, the subjects or organizations receiving them, finite inspection and interpretation capacity, ranking and filtering mechanisms, interruption costs, verification burden, decision deadlines, and the institutional or technical rules through which some signals obtain priority over others.*

The economic object is therefore the allocation of cognitive and organizational processing capacity. More information can improve decisions when it increases relevant accessible evidence, yet additional signals can also worsen selection, increase noise, or crowd out slower forms of judgment. Information abundance and epistemic capacity must remain distinct.

Proposition 21.149 (Attention-bottleneck condition). *An increase in available information enlarges effective knowledge only where selection, interpretation, verification, memory, and decision capacities expand sufficiently to prevent attention from becoming the binding constraint.*

21.8.5 Knowledge Access and Reproducibility

Knowledge has an unusual scarcity profile because the costs of producing, verifying, transmitting, reproducing, and applying it can differ sharply. Hayek emphasized that economically relevant knowledge is dispersed and incompletely possessed by sepa-

rate individuals (Hayek 1945). Arrow, from another direction, emphasized uncertainty and appropriation problems surrounding inventive activity and information (Arrow 1962). Digital reproduction can greatly reduce the marginal cost of copying some knowledge without eliminating scarcity in discovery, validation, interpretation, tacit skill, infrastructure, or access rights.

Knowledge can therefore be abundant as encoded information while scarce as trusted, usable, context-sensitive capability. A research article may be freely downloadable while the instrumentation, mathematical preparation, language ability, tacit laboratory skill, or institutional access required to use it remains scarce. Conversely, enclosure through intellectual property, secrecy, paywalls, proprietary data, or platform control can produce access scarcity for an informational good whose technical reproduction is inexpensive. Commons-oriented work on knowledge highlights precisely these governance questions of access, preservation, enclosure, and collective production (Hess and Ostrom 2007).

Definition 21.150 (Knowledge-access profile). A *knowledge-access profile* specifies the knowledge object, production and verification costs, reproducibility, codifiability, tacit components, legal and technical access conditions, required absorptive or interpretive capacity, infrastructure dependencies, provenance, and the institutions through which knowledge is maintained, transmitted, revised, or enclosed.

This profile prevents two opposite reductions. Knowledge should not be treated as conventionally scarce merely because its creation is costly, nor as universally abundant merely because its digital copy has near-zero marginal cost. Scarcity can move from reproduction to validation, attention, trust, computation, specialized skill, or institutional access.

Proposition 21.151 (Knowledge-scarcity relocation condition). *When reproduction costs fall substantially, the economically binding scarcity of knowledge may relocate to discovery, verification, interpretation, attention, absorptive capability, infrastructure, provenance, or authorized access; analysis should identify that relocation rather than infer practical abundance from copying cost alone.*

21.8.6 Capability Constraint and Conversion

Resource abundance does not imply that persons possess the substantive capability to convert resources into valued activities or states. Capability-oriented analysis therefore changes the scarcity question. The relevant issue is not only whether a resource exists or is formally distributed, but whether conversion factors, social arrangements, bodily conditions, public services, infrastructure, and institutional standing permit a person to use that resource in practice (Sen 1999).

This distinction applies beyond personal welfare. Firms can possess capital while lacking organizational capability; public agencies can receive budgets while lacking implementation capacity; communities can have formal rights without the collective infrastructure required to exercise them. Capability scarcity is consequently relational to a task, subject, conversion environment, and temporal horizon.

Definition 21.152 (Capability-constraint profile). A *capability-constraint profile* specifies the subject, valued or required functioning, available resources and formal en-

titlements, personal, social, institutional, and infrastructural conversion conditions, practical alternatives, dependency relations, retained capability after action, and the mechanisms through which capability can be maintained, regenerated, or depleted.

The same nominal allocation can therefore generate different substantive opportunity. Equality of money, formal rights, information, or equipment may leave substantial differences in mobility, care support, health, language, organizational authority, network access, or technical skill. The economic comparison must match the level of scarcity to the object being evaluated.

Proposition 21.153 (Resource–capability separation condition). *A resource distribution supports a claim about substantive opportunity only where the relevant conversion conditions and practical alternatives are sufficiently specified to connect resource command to the capability being evaluated.*

21.8.7 Generative Opportunity Availability

The preceding distinctions concern existing resources, positions, information, and capabilities. GRE adds a further comparative coordinate: whether an economic arrangement preserves the practical ability to generate new options, relations, capabilities, institutions, knowledge, and value processes. This coordinate was developed throughout Part VII and is especially important when present abundance is produced by consuming the infrastructures or capabilities required for later creation.

Generative opportunity is therefore distinct from the number of presently available choices. A household can have many consumption options while lacking time, security, education, or social infrastructure for future capability formation. A firm can operate efficiently while allowing maintenance capability to decay. A society can enjoy abundant digital outputs while becoming dependent on a narrow technical infrastructure that reduces future substitutability. The relevant scarcity is scarcity of practical future formation.

Definition 21.154 (Generative-opportunity profile). *A generative-opportunity profile specifies the subject or collective, the capacities and infrastructures from which new options can be formed, access to learning and experimentation, relational and institutional support, option-preserving reserves, dependencies and lock-ins, maintenance and regeneration requirements, and the horizon over which present arrangements enlarge or contract later reachable possibilities.*

Generative opportunity should not be treated as a universal scalar good. Some future options may be harmful, rights-violating, or ecologically destructive. The coordinate is analytical before it is normative: it identifies which capacities for future formation are being created or lost so that normative evaluation can address them explicitly.

Proposition 21.155 (Present-abundance separation condition). *Present resource or output abundance implies generative abundance only where the arrangement also preserves the capacities, infrastructures, maintenance pathways, and practical option-formation processes required for future creation and revision.*

21.8.8 Distributional Position and Incidence

Distribution concerns the arrangement of economically consequential resources, claims, burdens, risks, positions, capabilities, and opportunities across subjects. Different theories select different distributive objects. Classical political economy emphasized distribution among social classes; welfare economics can focus on income or utility; capability approaches evaluate substantive opportunities; feminist and care economics draw attention to unpaid work, time, dependency, and reproductive burdens; ecological analysis can include exposure to environmental harms and access to regenerative resources. The theoretical disagreement can therefore concern the object of distribution before it concerns the preferred distribution.

A distributive statement also requires an incidence boundary. Income received by a household may conceal internal allocation. A subsidy received by a firm may ultimately benefit workers, owners, consumers, or suppliers depending on market and institutional conditions. A pollution burden can be spatially displaced or deferred across generations. Distribution is therefore a relational and temporal object rather than merely a cross-sectional vector.

Definition 21.156 (Distributional-incidence profile). A *distributional-incidence profile* specifies what is distributed, the subjects or positions among which it is distributed, the unit and scale of observation, direct and indirect incidence, temporal incidence, intra-unit distribution where relevant, the mechanisms producing the distribution, and the capabilities or dependencies through which nominal receipt becomes practically consequential.

This profile separates descriptive distribution from normative judgment. A theory can identify concentration or burden without yet specifying the distributive principle by which the pattern should be evaluated. Conversely, a normative distributive criterion requires a sufficiently precise object and incidence structure to avoid evaluating the wrong distribution.

Proposition 21.157 (Distribution-object specification condition). *Cross-theoretical claims about distribution are comparable only where the distributed object, subject boundary, incidence mechanism, temporal horizon, and aggregation level are sufficiently aligned or their differences are retained explicitly.*

21.8.9 Allocation Mechanisms and Decision Rights

Allocation concerns the processes through which resources, positions, burdens, attention, or opportunities are assigned among uses and subjects. Markets, prices, administrative rules, queues, lotteries, bargaining, household decisions, professional judgment, commons governance, political budgeting, algorithms, and hybrid institutions can all perform allocative functions. The existence of scarcity therefore does not identify one necessary allocation mechanism.

Allocation should also be distinguished from distribution. An allocation rule is a process; distribution is one pattern of incidence produced through that process together with initial conditions, feedback, strategic behavior, and institutional structure. Market allocation can generate different distributions under different endowments and power relations. Administrative allocation can generate different

outcomes under different eligibility rules and implementation capacities. Commons governance can allocate use rights through collective rules that do not fit a simple market–state binary (Ostrom 2010).

Definition 21.158 (Allocation-mechanism profile). An *allocation-mechanism profile* specifies the item being allocated, eligible subjects and uses, decision rights, information available to decision makers, selection or priority rule, prices or other signals where relevant, enforcement, appeal and revision procedures, strategic incentives, transaction and coordination costs, and the distributional and generative consequences produced over time.

A mechanism can be effective for one allocative problem and poorly suited to another. Prices can coordinate decentralized exchange where relevant claims are represented through effective demand; administrative rules can protect rights or pursue collective objectives; professional judgment can incorporate contextual information; lotteries can distribute equally qualified scarce slots; and polycentric arrangements can distribute authority across multiple decision centers. Comparative analysis should therefore identify mechanism-specific conditions rather than treating allocation as synonymous with one institutional form.

Proposition 21.159 (Allocation–distribution separation condition). *The evaluation of an allocation mechanism should distinguish its decision process from the distribution it produces and should include the initial positions, information structure, decision rights, strategic responses, and feedback processes through which allocative rules generate distributive outcomes.*

21.8.10 Relational Reproduction and Scarcity Relocation

Allocation and distribution are history-producing processes. They alter ownership, capability, knowledge, network position, bargaining power, infrastructure, expectations, maintenance, and future access. A solution to one scarcity can therefore create another. Automation can reduce scarcity of routine production while increasing scarcity of trusted judgment or specialized infrastructure. Digital abundance can reduce copying costs while concentrating attention or control. Expanded educational access can relax knowledge scarcity while leaving positional scarcity in elite credentials. Resource extraction can relax current material scarcity while creating future ecological scarcity.

This dynamic is best described as *scarcity relocation*. The concept does not imply that every scarcity is conserved or merely moved. Innovation, institutional reform, cooperation, substitution, and regeneration can genuinely relax constraints. The analytical point is that relaxation at one coordinate should not be inferred to constitute overall abundance until its effects on other coordinates and future periods have been examined.

Definition 21.160 (Scarcity-relocation record). A *scarcity-relocation record* identifies an initial scarcity, the intervention or economic process that relaxes or transforms it, the resources and relations mobilized by that process, new or intensified constraints appearing elsewhere, the subjects bearing those constraints, the temporal displacement involved, and the mechanisms through which the new scarcity can be mitigated, reproduced, or further transformed.

The relational consequence of distribution is similarly cumulative. Distribution can alter future bargaining positions, learning capacity, health, political voice, access to credit, network centrality, and the ability to absorb shocks. Allocation can therefore reproduce scarcity by shaping the conditions under which future claims are made. Conversely, social investment, public infrastructure, open knowledge, capability formation, maintenance, and institutional redesign can convert a distributive intervention into a reduction of later scarcity.

Proposition 21.161 (Scarcity-relocation visibility condition). *A claim that an economic arrangement reduces scarcity is stronger where the analysis traces whether the constraint is eliminated, relaxed, deferred, redistributed among subjects, transferred across scales, or transformed into another scarcity coordinate.*

The comparative result of this section is therefore a change in the unit of theoretical dialogue. Scarcity is not a single background fact to which theories merely offer different solutions. It is a typed, historically situated relation among resources, subjects, institutions, conversion conditions, attention, knowledge, capabilities, and future possibilities. Distribution identifies where economically consequential objects and burdens are located; allocation identifies the mechanisms and decision rights through which they are assigned; and relational reproduction identifies how those arrangements change the scarcity conditions faced later. This architecture prepares Section 21.9, where the temporal forms assumed by economic theories—equilibrium time, historical time, path dependence, crisis, structural transformation, irreversibility, and open futures—become the next object of comparison.

21.9 Economic Temporalities and Historical Change

Section 21.8 compared scarcity, access, allocation, and distribution by separating resource conditions from the relational mechanisms through which scarcity is produced, relaxed, or relocated. The present section adds the temporal coordinate required for theoretical dialogue. Its role is to compare how economic theories represent sequence, duration, recurrence, expectation, reproduction, cumulative change, discontinuity, and future possibility. The objective is neither to privilege historical description over abstraction nor to treat dynamic language as inherently superior to static analysis. The relevant question is whether a theory's temporal representation preserves the mechanisms necessary for the claim being made. The section therefore moves through equilibrium and comparative-static time, historical sequence, path dependence, evolutionary change, crisis, structural transformation, multiple timescales, irreversibility, and open futures. Table 21.9 summarizes the resulting comparative coordinates.

Definition 21.162 (Economic temporal architecture). *An economic temporal architecture specifies the economically relevant events or states, their ordering and duration, the mechanisms connecting earlier and later configurations, the role of expectation and memory, the rates and scales of change, the conditions of recurrence or persistence, the degree of reversibility, and the structure of future possibilities represented by an economic theory or model.*

A temporal architecture is therefore more than a time index attached to variables.

Table 21.9: Temporal architectures for theoretical dialogue in economics

Coordinate	Primary analytical question	Characteristic reduction risk
Equilibrium time	Which adjustments or state comparisons are represented while the relevant structure is held fixed?	Treating a useful analytical closure as a complete history
Historical sequence	Which events, institutions, or expectations depend on their order and timing?	Treating temporal order as interchangeable
Path dependence	Through which mechanism do earlier events alter later reachable configurations?	Using path dependence as a synonym for any historical influence
Evolutionary time	How do routines, variation, learning, innovation, and selection alter populations or organizations?	Treating change as movement toward a predetermined optimum
Crisis	Which relations change mode, activate rapidly, or cross thresholds?	Treating every large disturbance as one common crisis mechanism
Structural transformation	Which economic objects, relations, or rules are reconfigured rather than merely re-sized?	Equating quantitative growth or decline with structural change
Multiple timescales	Which processes operate at different rates and how are the rates coupled?	Comparing observations across incompatible temporal scales
Irreversibility	Which consequences, capabilities, or histories cannot be restored by reversing the initiating action?	Treating formal policy reversal as practical restoration
Open futures	Which future objects, options, and trajectories can be generated beyond the currently represented state space?	Treating uncertainty as variation within a fixed catalogue of outcomes

Two theories can use the same calendar time while making different claims about what persists, what can change, which earlier events remain causally active, and whether the future is a known continuation of an existing state space or a domain in which new objects and relations may emerge. A relational comparison should preserve these differences before asking whether theories can be translated into a shared dynamic vocabulary.

Proposition 21.163 (Temporal-adequacy condition). *A temporal representation is adequate to an economic claim when the representation preserves the sequence, persistence, feedback, expectation, irreversibility, and scale relations that materially affect the mechanism under analysis; greater temporal detail does not by itself imply greater explanatory adequacy.*

21.9.1 Equilibrium and Comparative-Static Time

Equilibrium and comparative-static analysis provide a powerful temporal compression. They can ask how an economic system is characterized when specified adjustment conditions are satisfied, or how the represented equilibrium changes when a parameter changes while the underlying model structure is held fixed. Hicks's treatment of equilibrium and expectations and Samuelson's formal consolidation of comparative statics illustrate the analytical productivity of such closure (Hicks 1939b; Samuelson 1947). The temporal question is therefore not whether equilibrium analysis contains literal clock time, but which historical and adjustment processes have been compressed into the relation among states.

The compression can be adequate when the research question concerns local incidence, comparative responses, feasibility, or a sufficiently stable institutional environment. Its interpretation becomes more demanding when the process of adjustment itself changes preferences, capabilities, technologies, institutions, expectations, or the available set of economic objects. In such cases, the before-and-after states can remain informative while failing to represent the mechanism that connects them.

Definition 21.164 (Comparative-static temporal profile). *A comparative-static temporal profile specifies the state variables being compared, the parameters or conditions allowed to change, the relations treated as fixed during comparison, the adjustment process left implicit, the stability assumptions that support the comparison, and the historical mechanisms excluded from the represented transition.*

Equilibrium time should therefore be interpreted as one possible analytical resolution. A price adjustment, for example, may be represented without reconstructing the institutional history of the market if that history is locally irrelevant. A labor-market transition involving deskilling, migration, credential change, or organizational restructuring may require a richer temporal representation because the adjustment changes the subjects and relations being compared.

Proposition 21.165 (Comparative-static scope condition). *A comparative-static result supports a claim about historical transition only to the extent that the omitted adjustment processes do not materially transform the objects, relations, constraints, or expectations on which the compared states depend.*

21.9.2 Historical Sequence and Event Dependence

Historical time becomes analytically important when sequence and timing affect the meaning or consequence of economic events. The establishment of a payment standard before a platform becomes dominant can have different consequences from introducing the same standard after network dependence has formed. A subsidy implemented before productive capability has disappeared can operate differently from the same subsidy introduced after organizational knowledge has been lost. The economic relevance lies in the dependence of later relations on the order and temporal placement of earlier events.

Historical sequence also changes what actors know and expect. An event that was unforeseeable at one moment can become a precedent at another. Institutions acquire records, reputations, routines, legal interpretations, and expectations through

sequences of implementation. North's treatment of institutional change emphasizes the historical persistence of institutional structures and their consequences for incentives and economic performance (North 1990). A temporal comparison should therefore distinguish chronology from causal sequence: events can occur in order without that order being economically consequential, while some ordering relations are central to the mechanism.

Definition 21.166 (Historical-sequence profile). A *historical-sequence profile* specifies the economically relevant events, their partial or chronological ordering, the relations whose state is altered by each event, the information and expectations available at each stage, the mechanisms through which earlier events condition later ones, and the counterfactual reorderings relevant to the claim.

This profile supports historical comparison without requiring every economic explanation to become a complete narrative. The analyst can isolate a consequential sequence—for example, investment, standardization, skill formation, market concentration, and regulatory response—while retaining only those historical details needed to establish the mechanism.

Proposition 21.167 (Sequence-relevance condition). *Temporal order is economically explanatory when changing the order or timing of relevant events would alter the mechanism, feasible continuation, distributional incidence, or interpretation of later states under the assumptions of the analysis.*

21.9.3 Path-Dependent Economic Development

Path dependence gives a more specific meaning to historical dependence. David's discussion of QWERTY and Arthur's analysis of increasing returns in competing technologies provide influential economic formulations in which early events can affect later adoption through mechanisms such as technical interrelatedness, increasing returns, learning, coordination, or quasi-irreversibility (David 1985; Arthur 1989). The general lesson is narrower than the statement that history matters. A path-dependent account should identify how an earlier event changes the transition possibilities or relative attractiveness of later alternatives.

The same analytical form can appear in institutions, infrastructures, skills, standards, settlement patterns, and organizational routines. Yet path dependence should not imply permanent lock-in. A path can weaken when complementary investments depreciate, substitutes improve, coordination changes, political coalitions shift, or deliberate transition policy creates new infrastructure. Path dependence is consequently a mechanism-dependent modification of reachability rather than a metaphysical claim that the past determines the future.

Definition 21.168 (Path-dependence profile). A *path-dependence profile* specifies the historically contingent event or sequence, the self-reinforcing or persistence mechanism, the economic objects whose later state is affected, the alternatives whose relative reachability changes, the strength and duration of persistence, and the conditions under which the path can branch, decay, or be deliberately reconfigured.

This definition also separates path dependence from ordinary state dependence. Current capital stock may affect future output because capital persists physically;

a path-dependent claim requires an additional mechanism through which a historically realized route changes later possibilities relative to relevant alternatives.

Proposition 21.169 (Path-mechanism condition). *A historical sequence warrants a path-dependence interpretation when an identifiable persistence or reinforcement mechanism makes later reachable configurations depend materially on the realized path rather than only on the contemporaneous state variables represented in the comparison.*

21.9.4 Evolutionary Adaptation and Selection

Evolutionary economic time emphasizes populations of heterogeneous agents, organizations, routines, technologies, and practices whose composition changes through variation, search, learning, innovation, replication, retention, and selection. Nelson and Winter developed an evolutionary theory in which routines, search, and competitive processes help explain changing firm and industry behavior over time (Nelson and Winter 1982). Schumpeter's analysis of development likewise foregrounded innovation and new combinations as mechanisms through which an established economic configuration can be disrupted (Schumpeter 1934).

Evolutionary language does not by itself imply biological identity or convergence toward an optimum. Economic selection environments are institutionally produced, strategically contested, and capable of changing through the activities of the entities being selected. Firms can influence standards and regulation; technologies can create complementary infrastructures; users can learn; governments can subsidize alternatives; and successful practices can alter the environment in which later selection occurs. Economic evolution is therefore often co-evolutionary.

Definition 21.170 (Evolutionary economic-time profile). *An evolutionary economic-time profile specifies the heterogeneous population or repertoire, sources of variation and novelty, mechanisms of learning or search, retention and reproduction processes, selection conditions, feedback from selected configurations to the selection environment, and the temporal horizon over which composition and capability change.*

The profile permits theoretical comparison between evolutionary, institutional, technological, and organizational accounts without presuming that they share one selection mechanism. It also helps distinguish adaptation within an existing regime from the generation of new economic objects or rules.

Proposition 21.171 (Evolutionary-openness condition). *An evolutionary economic explanation should specify both the mechanisms that retain and select existing variants and the mechanisms through which the relevant population, routines, technologies, or selection environment can themselves change over time.*

21.9.5 Crisis and Regime Discontinuity

Crisis compresses several possible temporal phenomena: rapid loss of coordination, liquidity interruption, cascading default, institutional legitimacy failure, supply disruption, political-economic rupture, or a threshold transition in which a previously stabilizing relation changes mode. The comparative task is to identify the mechanism rather than treat crisis as a self-explanatory category. A large decline in output, for

example, can accompany several distinct histories whose propagation structures, affected positions, and recovery possibilities differ.

A crisis also changes the temporal relevance of relations. Emergency credit lines, inventories, mutual-aid networks, legal powers, maintenance reserves, and administrative capacities that appear secondary during ordinary periods can become decisive. Conversely, routines optimized for stable operation can become liabilities when assumptions about demand, settlement, supply, or information fail. Work on critical transitions in complex systems provides one formal vocabulary for threshold-sensitive change, while its transfer to economic settings requires domain-specific identification of the relevant state variables, feedbacks, and thresholds (Scheffer et al. 2009).

Definition 21.172 (Economic crisis-transition profile). An *economic crisis-transition profile* specifies the initiating disturbance or endogenous instability, propagation relations, amplifying and damping mechanisms, activation of latent dependencies, affected positions, speed of change, threshold or regime features where relevant, emergency responses, recovery capacities, and persistent residues after the acute phase.

This profile allows crisis to be compared with ordinary fluctuation without assuming a universal threshold. Some crises are abrupt; others accumulate slowly and become visible only when a buffer fails. Some restore a previous configuration after intervention; others reorganize institutions, balance sheets, technologies, or political expectations.

Proposition 21.173 (Crisis-mechanism differentiation condition). A *crisis classification* supports theoretical comparison only when the analysis identifies the propagation, amplification, response, and recovery mechanisms that distinguish the relevant episode from ordinary variation and from other forms of crisis.

21.9.6 Structural Transformation and Reconfiguration

Structural transformation concerns change in the organization of economic relations rather than a change only in the magnitude of existing variables. Sectoral composition can shift; technologies can alter production architecture; ownership and coordination forms can change; labor can move among occupations; infrastructure can create new geographical relations; and legal or institutional revision can redefine economically recognized objects. Dosi's distinction between technological trajectories and discontinuities associated with new technological paradigms provides one influential account of how technical change can combine cumulative development with reorientation (Dosi 1982).

A structural account should therefore identify what structure means locally. It may refer to sectoral composition, class relations, network topology, institutional rules, technological architecture, spatial organization, or the set of feasible economic roles. Quantitative growth can occur with limited structural transformation, while substantial structural change can occur during periods of modest aggregate growth.

Definition 21.174 (Structural-transformation profile). A *structural-transformation profile* specifies the economic relations or organizational components being reconfigured, the mechanism of transformation, the old and emerging position structures, the

redistribution of capabilities and dependencies, the infrastructures and institutions supporting the transition, and the criteria by which the change counts as structural rather than merely scalar.

Structural transformation is especially relevant to theoretical dialogue because different traditions can identify different structures in the same historical episode. One theory may emphasize sectoral composition, another class relations, another institutional rules, and another technological networks. Translation should preserve these object differences before seeking a common narrative.

Proposition 21.175 (Structural-change identification condition). *A claim of structural transformation requires an explicit account of which relations, positions, rules, or organizational components have changed and why the change alters subsequent economic mechanisms rather than only the measured scale of activity.*

21.9.7 Multiple Economic Timescales

Economic processes rarely operate at a single rate. Prices can adjust within seconds, inventories within days, contracts over months, skills over years, infrastructures over decades, and ecological regeneration over still longer horizons. Institutional legitimacy, demographic structure, technological standards, and scientific capability can follow yet other temporal patterns. A theory that aggregates these processes into one time step can be useful, but the aggregation becomes problematic when fast and slow processes interact materially.

Fast adjustment can consume slow capacity. A firm can meet quarterly targets by deferring maintenance; a government can stabilize an immediate crisis while creating long-lived debt or institutional precedent; a platform can expand rapidly while standards and regulatory capacity adapt slowly. Conversely, slow infrastructures can stabilize fast activity by providing reliable coordination, storage, energy, communication, or legal expectation. The relevant temporal structure is consequently relational among rates.

Definition 21.176 (Multi-timescale economic profile). *A multi-timescale economic profile specifies the processes operating at materially different rates, their characteristic horizons, the variables or relations each process changes, the coupling among fast and slow dynamics, the observation intervals used in evidence, and the mechanisms through which changes at one timescale accumulate into or constrain another.*

Timescale selection also affects empirical interpretation. A policy can appear successful over one year and capability-depleting over a decade. A technological transition can look discontinuous at annual resolution and gradual at monthly resolution. A relational comparison should therefore specify the timescale at which a claim is expected to hold.

Proposition 21.177 (Timescale-matching condition). *Evidence and theoretical claims should be matched to the timescale of the mechanism being evaluated, especially where short-run adjustment can accumulate into long-run capability, institutional, infrastructural, or ecological change.*

21.9.8 Irreversibility and Hysteresis

Irreversibility concerns histories in which reversing an initiating action or parameter does not restore the previous practical configuration. The source may be physical destruction, sunk investment, lost skill, institutional precedent, ecological threshold crossing, migration, network reorganization, reputation, legal obligation, or expectation formation. Hysteresis is a more specific dynamic form in which the state reached depends on the prior path and exhibits persistence when a driving condition is reversed. Economic analysis should keep the broad practical concept of irreversibility distinct from any particular formal hysteresis model.

Path dependence and irreversibility are related but separable. A path can influence later choice while remaining practically reversible at moderate cost. An irreversible loss can occur without a self-reinforcing selection mechanism. The distinction matters for policy because formal repeal or price reversal can leave capabilities, infrastructures, debts, environmental damage, or organizational arrangements unchanged.

Definition 21.178 (Economic irreversibility profile). *An economic irreversibility profile specifies the action or event, the economic state or capability altered, the mechanism preventing or raising the cost of restoration, the temporal decay or persistence of that mechanism, the available repair, compensation, substitution, or successor pathways, and the degree to which return to the prior configuration remains practically reachable.*

This profile permits graded rather than categorical analysis. Some losses are technically reversible but institutionally difficult; others are financially recoverable but ecologically persistent; still others can be repaired only by constructing a successor arrangement rather than recreating the previous state.

Proposition 21.179 (Practical-return condition). *A claim of economic reversibility requires more than reversal of the initiating policy, price, or control variable; it requires a credible pathway through which the relevant capabilities, relations, infrastructures, obligations, and affected positions can be restored or functionally replaced.*

21.9.9 Open Futures and Endogenous Novelty

Some economic theories represent uncertainty within a fixed state space: future prices, outputs, shocks, or preferences are unknown while the catalogue of possible variables and outcomes is given. Other forms of change can alter that catalogue itself. Innovation can create a new product category; institutional reform can create a new right or organizational form; scientific discovery can make previously infeasible production possible; social movements can alter recognized claims; and artificial systems can generate new forms of coordination or dependency. Schumpeter's treatment of new combinations and evolutionary approaches to novelty provide important precedents for analyzing economic change in which the future is not exhausted by recombination within a fixed equilibrium system (Schumpeter 1934; Nelson and Winter 1982).

Open futures do not imply unrestricted possibility. Economic futures remain conditioned by existing capabilities, resources, institutions, ecological constraints, inher-

ited infrastructures, and power relations. Openness refers to the possibility that new economically relevant objects, relations, rules, and options can emerge through processes represented only incompletely in the present state description.

Definition 21.180 (Open-future economic profile). *An open-future economic profile specifies the presently represented state and option space, the mechanisms capable of generating new economic objects, relations, rules, or capabilities, inherited constraints on novelty, path-dependent reachability, processes that preserve or foreclose future formation, and the evidential limits on claims about trajectories whose relevant categories may themselves change.*

This coordinate clarifies the relation between uncertainty and generativity. Probabilistic uncertainty can concern which member of a represented outcome set will occur. Generative uncertainty can concern which economically relevant possibilities will become formable at all. The latter requires greater caution in long-horizon prediction and greater attention to option preservation, learning, and revision.

Proposition 21.181 (Future-space openness condition). *A long-horizon economic representation should treat its future state space as provisional when the mechanisms under analysis can generate new objects, relations, institutions, technologies, or evaluative categories that materially alter the set of economically reachable trajectories.*

The temporal coordinates developed in this section permit theoretical dialogue without imposing a universal theory of economic time. Equilibrium analysis can remain powerful where structural stability makes temporal compression appropriate; historical and path-dependent accounts become necessary where sequence changes reachability; evolutionary analysis emphasizes changing populations and routines; crisis and structural transformation identify discontinuous or constitutive change; multi-timescale analysis tracks coupled rates; irreversibility distinguishes return from formal reversal; and open-future analysis preserves endogenous novelty. These temporal distinctions prepare the next comparative problem. Section 21.10 examines how coordination, hierarchy, bargaining, institutional authority, dependency, and power operate within the economic configurations whose histories have now been differentiated.

21.10 Economic Power and Coordination Architectures

Section 21.9 differentiated economic theories by their temporal architectures, including equilibrium adjustment, historical sequence, path dependence, crisis, structural transformation, irreversibility, and open futures. The present section adds the power–coordination coordinate required for theoretical dialogue. Its role is to compare how economic theories explain the organization of interdependent action and how unequal positions become consequential within that organization. The objective is to keep coordination, authority, asymmetry, dependency, and power analytically distinct while showing how they can become coupled. The section proceeds through price-based coordination, hierarchy, class position, institutional authority, bargaining, network position, capability asymmetry, care dependence, platform mediation, and relational power. Table 21.10 summarizes the resulting comparative coordinates.

Definition 21.182 (Economic power–coordination architecture). An *economic power–coordination architecture* specifies the positions whose actions require coordination, the mechanism through which coordination is organized, the authority or control rights attached to those positions, the dependencies and outside options that condition participation, the informational and institutional environment, the pathways through which asymmetry can alter feasible action or terms, and the mechanisms of contestation, revision, or exit available to affected positions.

This definition does not treat power as the residue left after coordination has been described. Coordination mechanisms themselves distribute decision rights, information, timing advantages, access to alternatives, and capacities to revise rules. At the same time, unequal resources or capabilities do not automatically constitute power. A relational comparison should identify the mechanism through which a difference becomes effective in another position’s feasible actions, burdens, terms, or future capacities.

Proposition 21.183 (Coordination–power separation condition). *An account of economic coordination should distinguish the mechanism that organizes interdependent action from the mechanisms that convert positional asymmetries into effective influence, control, dependency, or constraint; successful coordination does not by itself establish an absence of power; and asymmetry does not by itself establish power.*

21.10.1 Price-Based Coordination

Price-based coordination is commonly represented as a way of aligning decentralized decisions without requiring one actor to possess complete information about the economy. Hayek’s account of dispersed knowledge emphasizes the informational role of price movements in communicating changes that no central participant need observe in full (Hayek 1945). Coase, in a different register, showed that market coordination itself is institutionally costly and coexists with organizational coordination inside firms (Coase 1937). The theoretical dialogue therefore concerns both what prices coordinate and the institutional conditions under which price signals become actionable.

A price can coordinate quantities, timing, entry, substitution, investment, or expectations while remaining silent about how initial property rights, purchasing power, participation conditions, or market boundaries were produced. Prices can also be administered, regulated, algorithmically generated, negotiated, or embedded in concentrated market structures. Price coordination should therefore be analyzed together with the rights and infrastructures that make exchange possible.

Definition 21.184 (Price-coordination profile). A *price-coordination profile* specifies the priced object or entitlement, participating and excluded positions, the mechanism of price formation, information transmitted through price, adjustment margins available to participants, property and contract conditions, market-entry and exit conditions, relevant concentration or intermediation, and the decisions coordinated through the resulting signal.

The profile permits two theories to agree that prices coordinate behavior while disagreeing over whether the relevant causal object is marginal substitution, dispersed knowledge, monetary convention, market structure, or institutionalized exchange. It

Table 21.10: Power and coordination architectures for theoretical dialogue in economics

Coordinate	Primary analytical question	Characteristic reduction risk
Price coordination	How do prices, rules of exchange, and market institutions coordinate decentralized plans?	Treating price-mediated coordination as institution-free or power-free
Hierarchy	Which decisions are allocated to authoritative organizational positions?	Equating hierarchy with arbitrary command or treating authority as costless
Class position	How do recurrent production and property positions affect collective or structural capacity?	Inferring effective power directly from class membership
Institutional authority	Who can define, interpret, enforce, or revise economically consequential rules?	Treating formal jurisdiction as complete practical control
Bargaining	How do outside options, information, patience, coalition, and enforceability shape negotiated terms?	Treating agreement as evidence of symmetric bargaining position
Network position	How do brokerage, centrality, bottlenecks, and substitution affect mediation capacity?	Inferring power from topology without specifying edge semantics or dependence
Capability asymmetry	When does unequal capability become dependency-mediated influence or control?	Equating superior capability with generalized power
Care dependence	How do asymmetric need, continuity, exit cost, and recognition shape vulnerability and authority?	Treating dependence as one-directional weakness or care as ordinary exchange
Platform mediation	How do access, ranking, standards, data, and interfaces coordinate multiple sides?	Treating multisided coordination as equivalent to neutral intermediation
Relational power	Through which relation does a difference alter another position's feasible action or future capacity?	Using power as a generic synonym for inequality, influence, or size

also prevents a price signal from being interpreted as a complete representation of bargaining position or social value.

Proposition 21.185 (Price-coordination scope condition). *A claim that prices coordinate an economic configuration should specify the decisions and information actually mediated by price and should separately identify the institutional, distributive, and power conditions that determine who can respond to the signal and on what terms.*

21.10.2 Hierarchical Authority and Organizational Coordination

Hierarchy coordinates activity by assigning some decisions to organizational roles whose directives are recognized within a bounded domain. Coase's analysis of the firm framed organizational authority as an alternative to repeated use of the price mechanism where market contracting is costly (Coase 1937). Williamson's institutional analysis later situated governance structures within comparative analysis of transaction and organizational arrangements (Williamson 2000). Hierarchy is therefore neither simply the absence of markets nor a synonym for domination. It is a specific allocation of decision rights, monitoring, information, and responsibility.

Organizational authority can reduce negotiation costs, support specialization, coordinate complementary tasks, and permit rapid response. It can also create dependency, suppress information, centralize discretion, or move risks toward positions with weaker voice. The same formal hierarchy can operate differently depending on professional norms, labor law, collective representation, internal appeals, ownership structure, and practical exit alternatives.

Definition 21.186 (Hierarchical-coordination profile). A *hierarchical-coordination profile* specifies the organizational domain, authoritative roles, delegated decision rights, monitoring and information channels, obligations of subordinate and supervisory positions, limits on discretion, accountability and appeal mechanisms, exit conditions, and the capabilities required to enact or contest organizational decisions.

Hierarchy can thus be compared across firms, public agencies, cooperatives, professional organizations, and hybrid institutions without presuming that every vertical relation has the same power content. The analytical question is which decisions the hierarchy coordinates and how the authority attached to those decisions is generated and bounded.

Proposition 21.187 (Hierarchical-authority condition). *Formal organizational rank supports a claim of effective hierarchical power only when the associated decision rights can be enacted through information, resources, monitoring, enforcement, or recognized authority in ways that alter the feasible actions of other organizational positions.*

21.10.3 Class Position and Structural Power

Class-oriented economic theories locate coordination and conflict partly in recurrent positions within production, ownership, and distribution. Marx's analysis of capitalist production emphasizes relations among owners of capital, labor power, production processes, and surplus appropriation rather than treating distribution as a sequence of isolated exchanges (Marx 1867). For theoretical dialogue, however, class position and class power should remain distinct. A structural position can generate recurrent interests, dependencies, or bargaining conditions without automatically producing collective organization or effective control.

Class power can operate through control over investment, employment, productive assets, political access, organizational resources, or the ability to absorb delay and exit. Workers can also acquire counter-capacity through organization, legal rights, collective bargaining, control over scarce skills, or coordinated withdrawal of labor. The relevant object is therefore not a scalar ranking of classes but the mecha-

nisms through which a structural position is converted into practical influence over production, distribution, or institutional change.

Definition 21.188 (Class-power profile). A *class-power profile* specifies the recurrent production or property positions under analysis, dependencies linking those positions, resources and organizational capacities available to each, relevant exit and delay capacities, collective-action structures, institutional protections, and the pathways through which position can alter terms of production, distribution, investment, or rule formation.

This profile allows class analysis to enter dialogue with bargaining, institutional, and capability approaches without reducing any of them to one another. Class can identify a persistent structural relation while bargaining analysis identifies local negotiation and institutional analysis identifies the rules through which that relation is stabilized or transformed.

Proposition 21.189 (Class-position conversion condition). *A class position becomes effective economic power through identifiable mechanisms that convert structural location into control, bargaining capacity, collective action, agenda influence, or durable dependency; class membership alone does not establish the magnitude or form of that power.*

21.10.4 Institutional Authority and Rule-Shaping Capacity

Institutional power operates through the capacity to define, interpret, enforce, classify, or revise rules that structure economic interaction. Commons emphasized collective action and working rules as central objects of institutional economics (Commons 1931); North similarly treated institutions as humanly devised constraints that structure political, economic, and social interaction (North 1990). Ostrom's research demonstrates that rule systems can be organized through multiple centers and participant arrangements rather than one universal governance form (Ostrom 1990; Ostrom 2005).

Formal jurisdiction is only one component of institutional authority. Statistical classifications, professional standards, licensing requirements, eligibility criteria, technical protocols, adjudication practices, and administrative interpretation can alter economically relevant possibilities without changing a statute. Institutional power is therefore partly rule-shaping and partly rule-enacting.

Definition 21.190 (Institutional-authority profile). An *institutional-authority profile* specifies the rules or classifications at issue, positions authorized to create, interpret, monitor, enforce, or revise them, the practical resources supporting those functions, procedures of participation and appeal, relations among overlapping jurisdictions, and the economic positions whose opportunities or obligations change through institutional action.

This profile also clarifies polycentric governance. Multiple institutions can possess partially overlapping authority, making coordination a problem of inter-institutional relation rather than centralized command. Power can then arise through jurisdictional bottlenecks, agenda control, expertise, information asymmetry, or the ability to define which institution has standing to act.

Proposition 21.191 (Rule-shaping power condition). *Institutional authority constitutes economic power to the extent that rule creation, interpretation, enforcement, classification, or revision changes the feasible actions, claims, burdens, or future capacities of other positions and affected positions possess unequal capacity to contest or revise those institutional effects.*

21.10.5 Bargaining Power and Outside Options

Bargaining analysis focuses attention on negotiated terms among positions whose interests are neither completely aligned nor completely independent. The same formal right to negotiate can coexist with radically different outside options, information, time horizons, risk-bearing capacities, coalition possibilities, legal protections, and ability to delay agreement. Agreement therefore does not by itself demonstrate symmetry. A party can accept terms because the feasible alternative is substantially worse.

Bargaining power is also relation-specific. A worker can have scarce technical expertise and still depend heavily on one employer because of visa status or geographic immobility. A small supplier can possess unique knowledge while facing severe liquidity constraints. A state can regulate a firm while depending on that firm's infrastructure or tax base. Bargaining should therefore be analyzed as a structured relation among alternatives, delay, information, commitment, and enforceability.

Definition 21.192 (Bargaining-power profile). *A bargaining-power profile specifies the parties and negotiated object, each position's practical outside options, information, capacity to delay or absorb non-agreement, coalition and representation possibilities, commitment and enforcement mechanisms, institutional protections, dependency relations, and the distribution of consequences if negotiation fails.*

The profile separates bargaining power from outcome alone. A favorable outcome can result from preferences, norms, regulation, or temporary circumstances; an unfavorable outcome need not prove weak bargaining power if the bargainer prioritizes other objectives. Power claims require the mechanism linking alternatives and capacities to the terms that become feasible.

Proposition 21.193 (Outside-option condition). *A bargaining-power claim should identify how practical outside options, delay capacity, information, coalition, or enforceability alter the feasible agreement set or the costs of non-agreement; formal freedom to reject an offer is insufficient where rejection is not practically sustainable.*

21.10.6 Network Position and Intermediation

Network theories and relational sociology emphasize that economic positions are embedded in structures of connection rather than linked only through anonymous exchange. Granovetter's analysis of embeddedness shows why ongoing social relations matter for economic action and institutional outcomes (Granovetter 1985). Network position can create access to information, brokerage opportunities, reputational advantages, exposure to contagion, or dependency on central intermediaries. Yet centrality is not itself power unless the relevant edges carry something that can be controlled or withheld.

A highly connected position can be vulnerable if connections transmit risk rather than alternatives. A peripheral specialist can exercise substantial influence if others depend on an irreplaceable connection. Network power therefore requires semantic interpretation of nodes and edges together with substitution, directionality, multiplexity, and temporal persistence.

Definition 21.194 (Network-intermediation profile). A *network-intermediation profile* specifies the economically relevant nodes and edge types, direction and substitutability of connections, flows mediated through the network, brokerage or bottleneck positions, dependencies created by topology, alternative routes, temporal persistence, and the mechanisms through which positional structure affects access, coordination, or control.

This profile supports comparison among supply networks, financial networks, labor referral networks, knowledge networks, and digital infrastructures without assuming one universal network-power metric. The same graph statistic can have different economic meaning when the edges represent trust, payment, ownership, technical dependence, or information.

Proposition 21.195 (Network-power identification condition). A *network position* supports a claim of economic power only when the topology and edge semantics jointly create a mechanism through which that position can alter access, timing, alternatives, information, or resource flows for other positions.

21.10.7 Capability Asymmetry and Dependency

Capability approaches direct attention to what subjects are substantively able to do, while the GRE power formalism developed earlier in the book distinguishes capability difference from its conversion into relational power. Sen's capability perspective emphasizes substantive opportunity and the heterogeneity of conversion between resources and effective freedom (Sen 1985; Sen 1999). For power analysis, unequal capability matters especially when one position becomes dependent on another for access to actions, resources, information, recognition, or infrastructures that cannot be substituted at acceptable cost.

A highly capable actor can coexist with others without dominating them when alternatives, interoperability, legal protections, counter-capacity, and institutional standing remain strong. Conversely, a modest capability difference can become powerful when attached to an indispensable bottleneck. The power object is consequently the dependency-mediated conversion of capability difference, not capability rank alone.

Definition 21.196 (Capability-dependency profile). A *capability-dependency profile* specifies the capabilities relevant to the relation, their distribution across positions, complements required for effective use, dependencies on other actors or infrastructures, substitutability and switching costs, temporal persistence, counter-capacities, standing and contestability, and the consequences of withholding or conditioning access.

This architecture is particularly important for AI-intensive economies, specialized infrastructure, expertise, finance, and public-service systems in which capability can

become concentrated while effective action remains distributed across dependent positions.

Proposition 21.197 (Capability-to-power conversion condition). *Capability asymmetry becomes relational economic power when dependence, limited substitution, control over complements, or institutional mediation enables one position to alter another position's feasible actions, terms, burdens, or future capability; superior performance alone is insufficient.*

21.10.8 Care Dependence and Relational Vulnerability

Care relations reveal forms of dependency that standard exchange or bargaining representations can capture only partially. Children, ill persons, disabled persons, older people, and others can depend on continuity, trust, tacit knowledge, bodily presence, or emotional and practical support that is difficult to substitute quickly. Caregivers can simultaneously depend on households, employers, welfare systems, migration regimes, or care recipients for income, legal status, recognition, or relational continuity. Feminist economics has emphasized that care and social reproduction are economically consequential even where market valuation is incomplete (Folbre 1994; Folbre 2001).

Dependence in care is therefore potentially reciprocal while remaining asymmetric in particular dimensions. The recipient can be vulnerable to withdrawal or neglect; the caregiver can be vulnerable to unpaid burden, weak bargaining position, limited exit, or moral expectations. Power analysis should preserve these differentiated vulnerabilities rather than treating dependence as a one-directional scalar.

Definition 21.198 (Care-dependency power profile). *A care-dependency power profile specifies the care needs and capabilities at issue, continuity and substitutability of the relation, temporal and bodily dependencies, resources and recognition available to caregivers and recipients, practical exit conditions, institutional support, representation and standing, and the consequences of interruption, neglect, coercion, or burden transfer.*

This profile also clarifies why market substitution can be incomplete. A monetary payment can expand options without recreating relational continuity, knowledge, trust, or availability. Conversely, idealizing care as purely relational can conceal exploitative burden or absence of exit. Coordination of care therefore involves both relational continuity and institutional protection.

Proposition 21.199 (Care-vulnerability condition). *Power in a care relation should be identified through the concrete dependencies, substitution limits, burden distributions, standing, and exit conditions that make one position vulnerable to another or to surrounding institutions; dependence alone does not determine a single direction of power.*

21.10.9 Platform Mediation and Infrastructural Control

Digital platforms coordinate multiple participant groups through interfaces, ranking, matching, payment, identity, standards, data processing, and access rules. Rochet and Tirole's analysis of two-sided markets shows that platform coordination can de-

pend on cross-side participation effects and price structures that cannot be understood as ordinary one-sided pricing (Rochet and Tirole 2003). Power analysis adds further questions: who controls admission, ranking, data, interoperability, dispute resolution, technical standards, and the terms under which participants can reach one another?

Platform mediation can be economically productive. Shared infrastructure reduces search costs, establishes compatibility, enables reputation, and creates access to large participant pools. Yet these same functions can become bottlenecks when participants accumulate sunk investments, ratings, audiences, data histories, or complementary tools that are costly to transfer. Coordination and dependency can therefore intensify together.

Definition 21.200 (Platform-mediation power profile). *A platform-mediation power profile specifies the participant sides coordinated by the platform, access and exclusion rules, ranking and matching systems, pricing and fee structures, data and identity controls, technical standards and interoperability, switching and multihoming conditions, appeal and dispute mechanisms, dependent complementary assets, and the pathways through which platform decisions alter participant reach or capability.*

The profile distinguishes platform scale from platform power. A large platform can face strong interoperability, contestability, and multihoming; a smaller platform can exercise substantial control if it governs an indispensable niche infrastructure. The relevant mechanism is control over mediated relations and alternatives.

Proposition 21.201 (Platform-control condition). *Platform power arises where control over access, ranking, standards, data, interfaces, or dispute mechanisms combines with participant dependence or limited substitution to alter the feasible terms of participation; multisided coordination or large scale alone is insufficient.*

21.10.10 Relational Power and Coordination Plurality

The preceding coordinates show why economic power cannot be reduced to one institutional form. Price systems, hierarchies, class relations, institutional rules, bargaining arrangements, networks, capability structures, care relations, and platforms can all coordinate activity while generating different pathways through which asymmetry becomes effective. These mechanisms can also coexist. A worker can simultaneously face a market wage, managerial hierarchy, professional licensing, household care obligations, network dependence, collective bargaining, and platform-mediated scheduling. No single coordinate necessarily exhausts the power structure of that position.

The relational approach developed in Chapter 16 provides a common discipline for comparing such cases without treating them as identical. A difference becomes power-relevant when it matters to another position's possible actions; it becomes relationally realized power when a mechanism converts that difference into altered feasible action, burdens, terms, capacities, or trajectories. The comparison remains typed because legal authority, bargaining leverage, infrastructural control, class power, care dependency, and platform control operate through different carriers and temporal structures.

Definition 21.202 (Relational power–coordination profile). A *relational power–coordination profile* specifies the coordination mechanisms operating in an economic configuration, the relevant positional differences, dependency and control pathways, institutional and infrastructural mediators, temporal persistence, domains in which power is effective, counter-capacities and contestability, and the interaction among multiple simultaneous power relations.

Coordination plurality also matters normatively and institutionally. Markets can counter some hierarchical dependencies; public institutions can constrain market power; collective organization can alter bargaining; interoperability can reduce platform lock-in; care infrastructure can reduce household dependence; and one governance arrangement can also create new bottlenecks elsewhere. Power analysis therefore benefits from examining conversion and counter-power across mechanisms rather than searching for one universally dominant institutional form.

Proposition 21.203 (Relational-power identification condition). A *comparative economic theory of power should identify the typed relation, the asymmetry or difference at issue, the mechanism of conversion, the affected domain, the resulting change in feasible action or future capacity, and the available counter-capacity; labels such as hierarchy, class, market power, dependence, or platform power are explanatory only when these relational components are made explicit.*

The power–coordination coordinates developed here permit theoretical dialogue without forcing every tradition into one concept of power. Price theories can emphasize decentralized adjustment; organizational theories can analyze authority; class approaches can track structural positions; institutional economics can trace rule systems; bargaining theories can focus on alternatives and negotiation; network analysis can identify intermediation; capability analysis can reveal dependency; care economics can recover relational vulnerability; and platform analysis can examine mediated access and infrastructural control. Their partial correspondences become analytically useful once their mechanisms remain typed. Section 21.11 therefore turns to the next comparison problem: how these traditions justify their claims through different forms of knowledge, evidence, and method.

21.11 Economic Knowledge, Evidence, and Methodological Warrant

Section 21.10 compared economic theories through their power and coordination architectures. The present section adds the epistemic coordinate required for theoretical dialogue. Its role is to compare how economic theories construct claims, what kinds of evidence they admit, which inferential operations connect evidence to propositions, and how the resulting warrant travels across contexts. The objective is to keep method, evidence, identification, interpretation, formal representation, and claim status analytically distinct while allowing them to be compared within a common relational framework. The discussion proceeds through deduction, econometric inference, historical reconstruction, institutional analysis, experimental evidence, situated observation, simulation, formal modelling, plural evidential regimes, and methodological translation. Table 21.11 summarizes the resulting coordinates.

Definition 21.204 (Economic evidential–methodological architecture). An *economic evidential–methodological architecture* specifies the economic object and claim under investigation, the observations or representations treated as evidence, the method through which those materials are generated or organized, the inferential operations that connect them to a conclusion, the assumptions required for that inference, the uncertainty and missingness retained, the domain and temporal scope of the resulting warrant, and the conditions under which the claim should be revised, transported, or withheld.

The definition treats evidence as claim-relative. The same administrative record can support a descriptive claim about recorded employment, contribute to an econometric identification strategy, enter a historical reconstruction, or reveal an institutional classification practice. Its evidential role changes with the proposition being supported and the inferential pathway through which it is used. A theoretical dialogue should therefore compare architectures of warrant rather than rank methods in the abstract.

Proposition 21.205 (Warrant-locality condition). *The evidential force of a method should be evaluated relative to the claim, object, scale, assumptions, and inferential pathway for which it provides warrant; methodological prestige or technical sophistication does not by itself enlarge the scope of the supported conclusion.*

21.11.1 Deductive Theoretical Inference

Deductive reasoning remains central to economic theory because it makes conditional implications explicit. A model can begin with preferences, technologies, institutional constraints, accounting identities, behavioral rules, or other premises and derive consequences that follow within the specified formal domain. Samuelson's *Foundations of Economic Analysis* exemplifies the effort to clarify economic reasoning through explicit mathematical structure and comparative conditions (Samuelson 1947). The strength of deduction lies in the traceability of the inferential chain: where premises and rules are explicit, the relation between assumptions and conclusions can be examined directly.

Logical validity, however, answers a different question from empirical adequacy. A conclusion can follow correctly from premises whose semantics, measurement correspondence, behavioral relevance, or domain of application remain uncertain. Conversely, an empirically successful regularity can lack a complete deductive derivation. The theoretical dialogue therefore benefits from separating internal implication from the warrant for treating the premises as an adequate representation of the economic configuration.

Definition 21.206 (Deductive-inference profile). A *deductive-inference profile* specifies the premises and definitions, formal domain, transformation or inference rules, derived propositions, semantic interpretation of the formal objects, empirical or institutional correspondence claimed for those objects, and the scope within which the derived implications are intended to apply.

This profile also makes comparison between theories more precise. Two theories can derive similar propositions from different premises, or use similar formal machinery while assigning different economic meaning to the variables. Shared mathe-

Table 21.11: Evidential and methodological architectures for theoretical dialogue in economics

Coordinate	Primary epistemic contribution	Characteristic warrant risk
Deductive inference	Derives consequences from explicit premises and formal relations	Extending logical validity beyond the empirical or semantic adequacy of the premises
Econometric inference	Estimates empirical relations and, under additional assumptions, identifies causal or structural parameters	Treating statistical precision as causal identification or transportability
Historical reconstruction	Reconstructs sequence, context, contingency, and mechanism through temporally situated evidence	Treating chronology or narrative coherence as sufficient causal warrant
Institutional analysis	Connects rules, organizations, practices, and enactment to economic outcomes	Treating formal rules as complete representations of institutional operation
Experimental evidence	Generates controlled or quasi-controlled variation for bounded causal claims	Extending local treatment effects beyond the experimental population, mechanism, or institutional setting
Situated observation	Reconstructs meaning, practice, tacit knowledge, and local relational structure	Generalizing interpretive depth without an explicit scope argument
Simulation	Examines consequences generated by specified rules, agents, interactions, and parameterizations	Treating internally generated patterns as direct empirical confirmation
Formal modelling	Clarifies mechanisms, consistency, structural relations, and conditional implications	Treating mathematical closure as empirical completeness or ontological proof
Plural evidential regime	Combines partially non-equivalent forms of evidence around a shared object	Treating accumulation of heterogeneous evidence as automatic convergence
Methodological translation	Maps claims and warrants across methods while preserving differences in evidential status	Translating conclusions while dropping assumptions, scope, or inferential remainder

matics therefore supplies a possible structural correspondence without establishing substantive identity.

Proposition 21.207 (Deductive-scope condition). *A deductively valid economic proposition acquires empirical or explanatory warrant only to the extent that the premises, semantic interpretation, and domain assumptions supporting the derivation are adequate to the economic object and claim under consideration.*

21.11.2 Econometric Identification and Statistical Inference

Econometric analysis connects economic claims to statistical variation in observed or constructed data. Its epistemic contribution ranges from description and estimation to forecasting, structural parameter recovery, and causal identification. Modern applied econometrics places particular emphasis on research designs that make the assumptions supporting causal interpretation visible (Angrist and Pischke 2009; Wooldridge 2010). The methodological issue is consequently broader than whether an estimated coefficient is statistically distinguishable from zero.

A dataset is already a representation produced through classification, sampling, administrative procedure, measurement technology, and institutional practice. Identification then adds further assumptions concerning counterfactual comparison, selection, exclusion, timing, interference, functional form, measurement error, or model specification. Statistical precision concerns uncertainty within this architecture; it does not erase uncertainty concerning the architecture itself.

Definition 21.208 (Econometric-identification profile). An *econometric-identification profile* specifies the target estimand or parameter; population and unit, data-generating and measurement processes, source of identifying variation, counterfactual or structural assumptions, treatment and outcome definitions where applicable, interference and selection conditions, uncertainty representation, robustness checks, and the population, mechanism, and temporal scope to which the estimate is claimed to apply.

The profile separates several possible claims that often travel together in prose: an association is present; a parameter is statistically identified under stated assumptions; an intervention caused an effect in a studied population; the mechanism has been identified; and the result transports to another setting. Each step requires additional warrant.

Proposition 21.209 (Identification-to-claim condition). An *econometric estimate* should support only those descriptive, causal, structural, or predictive claims for which the identification assumptions, measurement architecture, population, and transport conditions provide adequate warrant; statistical significance alone does not determine claim type or scope.

21.11.3 Historical Reconstruction and Contextual Evidence

Historical inquiry provides access to economic processes whose causal significance depends on sequence, institutional transformation, inherited categories, and contingencies that cannot be reconstructed from a cross-section alone. Archives, legislation, correspondence, organizational records, prices, demographic series, material traces, and earlier conceptual vocabularies can jointly reveal how an economic configuration emerged. North's institutional analysis illustrates the importance of historical persistence and institutional change for economic development (North 1990).

Historical evidence can support several distinct epistemic tasks: establishing that an event occurred, reconstructing chronology, identifying plausible mechanisms, tracing institutional genealogy, comparing trajectories, or assessing whether a later category can legitimately be projected backward. A dense narrative can be

historically illuminating while still leaving a particular causal contrast underdetermined. Historical rigor therefore depends on source provenance, triangulation, counterevidence, temporal ordering, and explicit discrimination among alternative reconstructions.

Definition 21.210 (Historical-reconstruction profile). A *historical-reconstruction profile* specifies the historical object and period, sources and provenance, sequence of relevant events, institutional and conceptual context, mechanisms proposed to connect those events, alternative reconstructions, missing or asymmetric archives, retrospective categories introduced by the analyst, and the scope of the historical claim being made.

Historical inquiry is especially important for GRE because subjects, institutions, values, capabilities, infrastructures, and boundaries can change during the process being explained. The evidential object is then a trajectory or configuration history rather than repeated observations of a stable entity.

Proposition 21.211 (Historical-warrant condition). A *historical economic explanation* should distinguish evidence for chronology, mechanism, interpretation, and counterfactual relevance, while preserving source limitations and the possibility that later categories only partially correspond to the historical objects being reconstructed.

21.11.4 Institutional Analysis and Rule-Based Evidence

Institutional analysis examines how rules, norms, organizational arrangements, property regimes, decision procedures, enforcement systems, and shared expectations structure economic action. North emphasizes institutions as constraints shaping interaction, while Ostrom's work on commons governance demonstrates the analytical importance of rule configurations, monitoring, participation, and locally organized governance beyond a simple market–state dichotomy (North 1990; Ostrom 1990). The relevant evidence therefore includes more than formal statutes or organization charts.

An institution operates through written rules, interpretations, tacit practices, enforcement, professional norms, technical systems, exemptions, informal sanctions, and participants' expectations. Formal equivalence between rules can coexist with substantial variation in enactment. Institutional analysis must consequently connect rule representation to observed or reconstructed practice.

Definition 21.212 (Institutional-evidence profile). An *institutional-evidence profile* specifies the institution and rule domain, formal rules and recognized roles, interpretive and enforcement practices, monitoring arrangements, informal norms, affected and participating positions, evidence of enactment, variation across sites or periods, exception and appeal mechanisms, and the economic consequences attributed to the institutional configuration.

This profile allows legal text, organizational data, interviews, administrative decisions, and observed practice to contribute different forms of evidence without treating them as interchangeable. A statute may establish an authorized rule; enforcement records may show practical implementation; participant accounts can reveal how the rule is experienced and navigated.

Proposition 21.213 (Rule–enactment correspondence condition). *An institutional economic claim should distinguish evidence concerning formal rule content from evidence concerning interpretation, enactment, enforcement, expectation, and practical effect; documentary existence of a rule is insufficient to establish its operative economic mechanism.*

21.11.5 Experimental and Quasi-Experimental Evidence

Experimental methods create or exploit variation intended to isolate a causal contrast within a bounded design. Laboratory experiments can control information and incentives closely; field experiments observe behavior in more natural institutional settings; natural and quasi-experiments use variation generated outside the researcher's direct control. Experimental economics and behavioral institutional research have shown that controlled variation can illuminate cooperation, reciprocity, rule compliance, market behavior, and institutional response (Ostrom 1998).

The central epistemic strength is design-based clarity about the comparison generating the causal claim. The main boundary concerns transport. An internally credible effect can depend on the recruited population, institutional environment, implementation, stakes, treatment version, interaction structure, or period. Scaling can also alter the mechanism through congestion, strategic adaptation, political response, learning, or equilibrium effects.

Definition 21.214 (Experimental-evidence profile). *An experimental-evidence profile specifies the causal contrast, assignment or quasi-assignment mechanism, experimental population and setting, treatment and comparison conditions, outcome definitions, interference and compliance structure, implementation process, uncertainty, ethical and behavioral consequences of observation, and the mechanism and population to which the result is proposed to transport.*

Experimental evidence therefore enters theoretical dialogue most productively when the theory specifies which mechanism the treatment perturbs. The same observed effect can be compatible with several explanations if the design distinguishes treatment response more clearly than underlying mechanism.

Proposition 21.215 (Experimental-transport condition). *An experimentally identified effect should be transported to another population, scale, institution, or period only through an explicit argument concerning the persistence of the relevant mechanism, treatment, interactions, and contextual conditions.*

21.11.6 Ethnographic and Situated Observation

Ethnographic and situated observational methods provide access to economic practices whose meaning and organization are difficult to reconstruct from standardized variables alone. Participant observation, interviews, field notes, situated documents, and thick contextual description can reveal tacit routines, informal classifications, care relations, workplace practices, reputational systems, embodied skill, and the practical interpretation of rules. Geertz's account of interpretive inquiry provides a canonical articulation of the importance of thick description for context-dependent meaning (Geertz 1973).

The epistemic contribution is depth of relational and semantic reconstruction. Its characteristic challenge is scope. Detailed access to one organization, community, household, market, or professional field can reveal mechanisms omitted by broader representations, but the extent to which those mechanisms recur elsewhere requires a separate comparative argument. Situated knowledge is therefore neither epistemically inferior to standardized evidence nor automatically generalizable from local depth.

Definition 21.216 (Situated-observation profile). A *situated-observation profile* specifies the field site and relational positions observed, researcher access and position, practices and meanings under reconstruction, observational and interview materials, temporal duration, interpretive procedures, divergent participant accounts, reflexive effects of observation, and the scope over which the reconstructed mechanism or meaning is claimed to travel.

Situated evidence is particularly valuable when economic categories themselves are part of the research object. Participants may enact categories such as household, worker, debt, obligation, skill, care, or fairness differently from the operational definitions used in a dataset. The divergence can identify a translation problem rather than a measurement nuisance.

Proposition 21.217 (Situated-warrant condition). A *situated economic interpretation* should preserve the relation among observed practice, participant meaning, researcher position, and inferential scope, while treating generalization to other configurations as an additional comparative claim rather than an automatic consequence of interpretive depth.

21.11.7 Simulation and Generative Computational Models

Simulation permits researchers to examine how specified rules, heterogeneous agents, networks, adaptation, and interaction can generate aggregate patterns that are difficult to derive analytically. Agent-based computational economics and generative social-science approaches make this logic explicit by asking whether a macro-pattern can be generated from a stated set of micro- or meso-level rules (Epstein and Axtell 1996; Tesfatsion 2006). Simulation is especially useful where feedback, path dependence, nonlinearity, heterogeneity, or endogenous structure complicate closed-form analysis.

A simulated pattern demonstrates what a specified model can generate. It does not by itself establish that the corresponding mechanism generated an observed economy. Empirical warrant requires additional calibration, validation, mechanism comparison, sensitivity analysis, or correspondence with independent evidence. Multiple rule sets can also generate superficially similar outcomes.

Definition 21.218 (Generative-simulation profile). A *generative-simulation profile* specifies model entities and state variables, interaction and adaptation rules, topology or environment, initialization, parameterization, stochastic components, output statistics, sensitivity and robustness procedures, empirical correspondences, rival generating mechanisms, and the domain in which simulated behavior is interpreted economically.

Simulation also provides a useful bridge between theory and history because path-dependent trajectories can be retained rather than compressed into a final equilibrium. Yet this advantage increases the importance of provenance: model code, parameter versions, randomization procedures, data interfaces, and output selection should remain reconstructable.

Proposition 21.219 (Simulation-warrant condition). *A simulated economic pattern supports a claim about possible mechanism within the specified model architecture; stronger claims concerning empirical mechanism, prediction, or historical explanation require independent warrant connecting the model's entities, rules, parameters, and generated patterns to the economic configuration studied.*

21.11.8 Formal Modelling and Structural Representation

Formal modelling expresses economic objects and relations through explicit mathematical or logical structures. Optimization, equilibrium systems, game forms, networks, dynamical systems, stochastic processes, operator structures, and other formalisms can clarify internal relations, reveal hidden assumptions, derive comparative consequences, and identify where intuitive arguments are incomplete. The methodological value of formalization therefore extends beyond prediction.

Formal models differ in epistemic status. Some are schematic representations intended to expose a mechanism; others are parameterized empirical structures; some function as analogies; others define exact identities or accounting relations. The dialogue among theories becomes confused when mathematical form is treated as a single evidential category. A theorem establishes a result in a formal system; an empirical model adds correspondence claims between that system and economic observations.

Definition 21.220 (Formal-model warrant profile). *A formal-model warrant profile specifies the formal objects and operations, economic semantics assigned to them, assumptions and closure conditions, propositions derived within the model, intended representational status, empirical or interpretive correspondence where claimed, sensitivity to excluded relations, and the boundaries beyond which the formal result is not asserted to travel.*

This profile is important for GRE because the book employs several formal languages as provisional representations. Formal tractability can reveal structure while still leaving ontological status suspended and empirical adequacy open to investigation.

Proposition 21.221 (Formal-representation condition). *The rigor of a formal derivation should be distinguished from the adequacy of the mapping between formal objects and economic reality; mathematical closure strengthens claims about implications within the representation while empirical, historical, or ontological claims require additional correspondence warrant.*

21.11.9 Plural Evidential Regimes

Complex economic objects frequently exceed the evidential reach of a single method. A policy can have an econometrically identified average effect while institutional

analysis explains implementation variation, historical evidence reveals path dependence, interviews identify burden transfer, and simulation explores long-horizon feedback. These contributions can be mutually informative while remaining non-equivalent. Pluralism is consequently an architecture of coordinated partial access rather than a requirement that every study use many methods.

Evidence can converge, conflict, or address different claims. Apparent disagreement can arise because methods study different populations, scales, periods, manifestations, or mechanisms. Apparent agreement can also be weak if several methods share the same upstream dataset, classification, or assumption. Evidential plurality therefore requires a map of dependence among evidence sources as well as a list of methods.

Definition 21.222 (Plural evidential-regime profile). *A plural evidential-regime profile specifies the claims being evaluated, evidential sources and methods contributing to each claim, inferential warrants attached to those contributions, dependencies or shared assumptions among evidence streams, convergences and conflicts, unresolved missingness, and the rule through which the combined evidence modifies confidence, scope, or theory choice.*

Plural evidence is especially valuable where economic configurations are multi-level. Statistical estimates can establish population regularities, institutional records can locate rule changes, ethnography can reveal lived enactment, and formal or simulation models can clarify candidate mechanisms. Integration remains claim-specific.

Proposition 21.223 (Evidential-triangulation condition). *Multiple forms of evidence strengthen an economic claim when their distinct inferential contributions and dependencies are specified and when convergence concerns the same proposition or complementary components of a shared mechanism; numerical accumulation of methods alone does not constitute triangulation.*

21.11.10 Methodological Translation and Warrant Preservation

The final coordinate concerns translation among methodological architectures. Deductive, econometric, historical, institutional, experimental, ethnographic, computational, and formal approaches can speak about the same economic configuration while warranting different kinds of claims. Translation becomes epistemically unsafe when a conclusion is preserved but the assumptions and claim status that originally supported it disappear.

A causal estimate can enter a historical explanation, but the estimate does not reconstruct the entire historical mechanism. An ethnographic finding can motivate variables for broader measurement, but operationalization can compress meanings that were central to the original observation. A simulation can formalize a mechanism suggested historically, but successful reproduction of a pattern does not retrospectively prove the historical mechanism. A formal theorem can discipline conceptual reasoning, while its application to an empirical domain still requires a correspondence argument.

Definition 21.224 (Methodological-translation profile). *A methodological-translation profile specifies the source method and claim, evidential basis, inferential warrant*

and assumptions, target method or theoretical architecture, preserved semantic and causal content, transformations introduced by the translation, losses or unresolved remainders, and the claim status legitimately retained after translation.

This profile supplies the epistemic bridge to the theory-specific sections that follow. Classical, neoclassical, Marxian, Keynesian, institutional, behavioral, evolutionary, feminist, capability, ecological, commons, sociological, and digital economic traditions differ partly because they privilege different objects and partly because they establish knowledge through different combinations of formal, historical, statistical, institutional, interpretive, and experimental warrants. The dialogue becomes useful when those warrants remain visible.

Proposition 21.225 (Warrant-preserving translation condition). *A claim translated across economic methods or theories should retain or explicitly reconstruct the assumptions, inferential status, domain, uncertainty, and evidential remainder that supported the source claim; semantic correspondence without warrant correspondence is insufficient for epistemic equivalence.*

Section 21.12 begins the theory-specific dialogue with classical political economy. The methodological coordinates developed here provide a common way to ask how each tradition constructs economic knowledge while preserving the possibility that its preferred evidential regime, explanatory object, or standard of warrant remains only partially translatable into GRE.

21.12 Classical Political Economy as Relational Architecture

This section begins the theory-specific dialogue by reconstructing classical political economy through the comparative coordinates developed in Sections 21.1–21.11. Its role is neither to assimilate classical political economy into GRE nor to treat it as an undifferentiated precursor of later economics. The objective is to recover a historically specific analytical architecture in which production, division of labor, distribution among social classes, accumulation, rent, profit, wages, demand, and institutional change were studied as mutually connected components of a political-economic order. The discussion emphasizes Smith, Ricardo, Malthus, and Mill, while reserving systematic analysis of Marxian political economy for Section 21.14. Table 21.12 summarizes the resulting dialogue coordinates.

Definition 21.226 (Classical political-economic configuration). *A classical political-economic configuration is a historically situated representation in which production, exchange, distribution, class position, property, population, accumulation, public institutions, and international trade are connected through mechanisms that determine the reproduction and transformation of wealth and the shares accruing to differently positioned groups.*

The definition is intentionally broad. Classical political economy did not possess one internally uniform theory, and the differences among Smith, Ricardo, Malthus, and Mill are analytically significant. What makes comparison useful is the recurring organization of economic inquiry around social production and distribution rather than the assumption that these authors shared one complete model.

Table 21.12: Relational coordinates for classical political economy

Coordinate	Classical analytical object	Translation risk
Production	Division of labor, productive organization, capital, land, and labor	Reducing production to a timeless input–output mapping
Distribution	Wages, profits, and rent distributed among social positions	Treating functional shares as merely ex post statistical categories
Class position	Workers, owners of stock or capital, landlords, and related positions	Projecting later class concepts backward without qualification
Surplus	Product above immediate replacement or subsistence requirements and its disposition	Equating heterogeneous classical surplus concepts with later surplus-value theories
Accumulation	Saving, capital formation, reinvestment, population, demand, and expansion	Treating growth as an autonomous scalar independent of distribution
Historical change	Commercial development, institutional reform, technology, population, and trade	Reading historically conditioned mechanisms as transhistorical laws
Relational reconstruction	Coupling among production, distribution, property, class, and reproduction	Translating every classical category into a GRE counterpart
Translation boundary	Non-equivalent semantics, normative premises, and historical assumptions	Treating conceptual correspondence as theoretical identity

Proposition 21.227 (Classical-architecture reconstruction condition). *A relational reconstruction of classical political economy should preserve the historically specific relations among production, distribution, class, accumulation, property, and institutional context before translating selected mechanisms into later theoretical vocabularies.*

21.12.1 Production and Division of Labor

Classical political economy places production near the center of economic analysis. Smith’s account of the division of labor links specialization to productive powers, exchange, market extent, capital accumulation, and the institutional organization of commercial society (A. Smith 1776). Production is consequently more than a transformation of given inputs. It is a historically organized relation among workers, tools, knowledge, capital, markets, and institutions through which productive capability itself can change.

Ricardo retains production as a central object while sharpening the analytical relation among labor, land, capital, value, and distribution (Ricardo 1817). Malthus similarly treats productive and unproductive labor, accumulation, demand, land, and population within a broader inquiry into the conditions under which wealth can continue to increase (Malthus 1820). Mill later organizes production around labor, capital, natural agents, cooperation, and increasing productive power while explicitly distinguishing the conditions of production from institutionally variable arrangements

of distribution (Mill 1848).

For theoretical dialogue, the important point is that productive organization is relationally consequential. Division of labor can increase output while also changing dependency, skill composition, bargaining position, occupational differentiation, and the extent to which production relies on market coordination or organizational authority. These consequences are not fully captured by a production total alone.

Definition 21.228 (Classical production profile). A *classical production profile* specifies the organization of labor, capital or stock, land and natural conditions, technical means, division of tasks, market extent, institutional supports, and the mechanisms through which their combination affects productive capacity and the reproduction of the economic order.

The profile permits dialogue with later production theory while preserving the wider social architecture in which classical analysis located productive activity. A modern production function can isolate a useful quantitative relation among inputs and output; classical production inquiry frequently asks a broader question concerning how the organization of society produces and reproduces those inputs, capacities, and positions.

Proposition 21.229 (Production-translation condition). A *translation of classical production into a later economic model should preserve the distinction between the technical transformation of inputs and the social organization through which labor, capital, land, knowledge, and market extent become productively combined.*

21.12.2 Distribution among Social Classes

Distribution is not an appended welfare question in classical political economy. Ricardo makes the distribution of the social product among landlords, capital owners, and laborers a central problem of political economy (Ricardo 1817). Smith likewise analyzes wages, profits, and rent as distinct forms of revenue connected to different positions within the productive and property structure (A. Smith 1776). Mill later emphasizes that distribution depends more directly than production on human institutions, laws, and social arrangements (Mill 1848).

This architecture differs from a representation in which production is first solved and distribution is then introduced as an external redistribution problem. Functional shares can affect accumulation, effective demand, labor reproduction, property relations, and the incentives or capacities of differently positioned groups. Distribution can therefore feed back into production and historical change.

Definition 21.230 (Classical distribution profile). A *classical distribution profile* specifies the social product being distributed, the positions entitled to wages, profits, rent, or other shares, the institutional and property relations supporting those claims, the mechanisms determining their relative magnitude, and the consequences of those shares for reproduction and accumulation.

A relational reading also distinguishes functional distribution from personal distribution. A household or individual can receive several types of income, while the analytical significance of wages, profit, or rent derives partly from the relational position through which the income claim is generated.

Proposition 21.231 (Distribution–production coupling condition). *When distributive shares alter saving, accumulation, demand, labor reproduction, land use, or bargaining conditions, distribution should be represented as a constitutive component of the production–reproduction process rather than solely as an ex post allocation of a fixed output.*

21.12.3 Class Positions and Functional Shares

Classical political economy frequently organizes distribution through recurring social positions. Smith's wages, profits, and rent correspond to different claims on the annual produce, while Ricardo's analysis of distribution gives particular analytical importance to relations among laborers, capital owners, and landlords (A. Smith 1776; Ricardo 1817). These positions are not identical to later Marxian class categories, even where there are historical and conceptual continuities.

For relational dialogue, class position can be reconstructed as a configuration of property relation, productive role, income claim, dependency, and reproduction. Such a reconstruction avoids two reductions. The first treats class merely as an income bracket. The second projects later theories of class consciousness, exploitation, or historical agency backward into authors who did not formulate those concepts in the same way.

Definition 21.232 (Classical class-position profile). *A classical class-position profile specifies a recurrent social position through its relation to labor, land, capital or stock, its characteristic income claim, its dependence on other productive positions, its institutional supports, and its role in the reproduction or transformation of the political-economic order.*

The profile is useful because functional shares acquire meaning through position. Rent is connected to landholding arrangements; profit to capital ownership and advance; wages to labor relations. Yet the categories remain historically contingent and internally heterogeneous. Their explanatory adequacy should therefore be established for the economic configuration under study.

Proposition 21.233 (Class-position specificity condition). *A comparison of classical class categories with later theories should preserve the specific property, production, and income relations that constituted each classical position and should avoid inferring later concepts of class power or historical agency solely from terminological similarity.*

21.12.4 Surplus and Reproduction

Classical political economy repeatedly encounters the question of how a society produces more than what is immediately required to replace used inputs or sustain ongoing production, and how the resulting excess is distributed or employed. The relevant concepts are heterogeneous. Smith discusses net and gross revenue, productive labor, profit, rent, and accumulation; Ricardo examines profits, rents, wages, and the distribution of produce; Malthus analyzes accumulation, effective demand, and the expenditure patterns required for continued growth (A. Smith 1776; Ricardo 1817; Malthus 1820).

A relational reconstruction should therefore use *surplus* cautiously. The term can

designate a residual product, a distributive share, a fund available for accumulation, or a social remainder after specified reproduction requirements. These are not interchangeable. Marxian surplus value, addressed later in Section 21.14, has a more specific theoretical derivation and should not be retroactively identified with every classical discussion of surplus or profit.

Definition 21.234 (Classical surplus–reproduction profile). A *classical surplus–reproduction profile* specifies the baseline requirements treated as necessary for continuing production, the residual product or income above that baseline, the positions receiving or controlling that residual, the mechanisms governing consumption or reinvestment, and the consequences for subsequent reproduction and accumulation.

This profile clarifies why surplus analysis is relational. A residual quantity has different economic consequences depending on who controls it, what obligations accompany it, whether it is consumed or reinvested, and whether the underlying reproductive conditions are themselves maintained.

Proposition 21.235 (Surplus-semantics condition). *Claims concerning classical surplus should specify the reproductive baseline, residual object, controlling position, and subsequent use of the residual; numerical excess alone is insufficient to establish equivalence among distinct surplus concepts.*

21.12.5 Accumulation and Economic Growth

Accumulation links present distribution to future productive organization. Smith connects saving and accumulation to the expansion of productive labor and the division of labor, while Ricardo analyzes accumulation in relation to profits, wages, rent, diminishing returns on land, and technical change (A. Smith 1776; Ricardo 1817). Malthus adds a distinctive concern with effective demand and the possibility that accumulation can encounter insufficiencies in expenditure or demand (Malthus 1820). Mill synthesizes several of these issues while distinguishing stationary-state possibilities from indefinite material expansion (Mill 1848).

The classical problem is therefore richer than a scalar increase in aggregate output. Growth depends on the disposition of distributive shares, population, market expansion, productive organization, land constraints, trade, institutions, and technology. Different mechanisms can support expansion at one stage and become limiting at another.

Definition 21.236 (Classical accumulation profile). A *classical accumulation profile* specifies the source of investible surplus or saving, the positions controlling its disposition, the productive uses to which it is directed, complementary labor and resource conditions, demand and market conditions, constraints on continued expansion, and the resulting transformation of distribution and productive structure.

A GRE dialogue can learn from this coupling between distribution and future capacity while resisting an easy equivalence between classical accumulation and generativity. Accumulation may enlarge productive capacity while degrading ecological conditions, concentrating dependency, narrowing future options, or displacing care and maintenance. Generativity therefore asks additional questions that classical ac-

cumulation theory does not always pose.

Proposition 21.237 (Accumulation–generativity distinction). *An increase in accumulated capital or productive capacity establishes a claim about economic expansion only within its specified classical mechanism; a claim of broader generativity requires additional analysis of capability reproduction, relational effects, ecological conditions, value plurality, and future-option structure.*

21.12.6 Historical Change and Institutional Context

Classical political economy developed within periods of commercial expansion, agrarian transformation, industrialization, population change, colonial and international trade, and institutional reform. Its categories therefore carry historical content even where authors sought general principles. Smith’s analysis of commercial society, division of labor, public institutions, taxation, and trade illustrates this broad historical horizon (A. Smith 1776). Ricardo’s concern with rent, machinery, trade, taxation, and distribution similarly reflects a specific political-economic configuration (Ricardo 1817). Mill makes the historical and institutional variability of distributive arrangements particularly explicit (Mill 1848).

Historical situatedness does not invalidate generalization. It changes the burden of proof. A mechanism derived from land scarcity, labor mobility, property law, manufacturing organization, or population dynamics may travel to another context only if the constitutive conditions remain sufficiently similar.

Definition 21.238 (Classical historical-context profile). *A classical historical-context profile specifies the commercial, technological, demographic, property, legal, political, and international conditions within which a classical mechanism was formulated, together with the conditions required for that mechanism to remain explanatory in another historical configuration.*

This is also where classical political economy is especially valuable for GRE. Its broad object frequently links economy, institutions, property, public authority, and historical development. GRE can recover that breadth while maintaining modern distinctions among empirical identification, normative judgment, formal representation, and historical reconstruction.

Proposition 21.239 (Historical-transfer condition). *A classical political-economic mechanism should be transferred across historical settings only after the property relations, institutional supports, technological conditions, demographic structure, and relevant resource constraints constitutive of that mechanism have been compared explicitly.*

21.12.7 Relational Reconstruction of Classical Political Economy

The preceding coordinates permit a relational reconstruction without claiming that classical political economy already contained GRE. Classical inquiry frequently links economic positions through production, property, exchange, distribution, accumulation, and public institutions. These relations can be represented as a history-bearing configuration in which changes in one domain alter the reproduction of others.

A productive improvement, for example, can modify labor demand, profits, market extent, investment, bargaining conditions, and distribution. Changes in rent can alter distributive shares and accumulation. Property rules can change who controls residual claims. Population and demand can modify wages, prices, and growth. Trade can change market extent, specialization, relative prices, and sectoral structure. The classical object is therefore often relational even where the formal vocabulary differs from GRE.

Definition 21.240 (Classical relational-reconstruction profile). A *classical relational-reconstruction profile* maps classical production, property, exchange, class position, distributive shares, accumulation, institutional conditions, and historical change into a connected analytical configuration while preserving the original semantics and evidential status of the classical concepts.

Three possible contributions to GRE are especially important. First, classical political economy keeps production and distribution tightly coupled. Second, it treats social positions and property relations as economically constitutive rather than as mere background characteristics. Third, it places accumulation and reproduction within a historical process rather than treating the economy solely as a timeless allocation mechanism.

These contributions are dialogical rather than genealogical claims of ownership. GRE can learn from them while adding concepts of heterogeneous value, capability reproduction, relational infrastructure, epistemic conditions, ecological regeneration, radical capability asymmetry, and future formation that are not reducible to classical categories.

Proposition 21.241 (Relational-reconstruction restraint). A *GRE reconstruction of classical political economy is warranted when it reveals structural correspondences among production, distribution, property, class position, and accumulation while leaving concepts without genuine semantic or mechanistic correspondence as explicit remainders rather than assimilating them into GRE vocabulary.*

21.12.8 Translation Boundaries and Theoretical Remainders

Theoretical dialogue requires boundaries as well as correspondences. Classical concepts were developed before many contemporary distinctions among welfare, capability, ecology, care, information, institutional design, econometric identification, and artificial agency. Their omission from a classical text does not establish that classical theory denies those objects; it often means that the object had not yet become analytically constituted in the same form.

Translation also encounters semantic remainder. Classical value, rent, profit, productive labor, class, accumulation, or wealth cannot always be mapped one-to-one onto later categories. Even where terms persist, their mechanism and scope may have changed. Conversely, GRE concepts such as generative opportunity or relational infrastructure can sometimes clarify a classical mechanism without being concepts that classical political economists themselves possessed.

Definition 21.242 (Classical translation-boundary profile). A *classical translation-boundary profile* records structural correspondences between classical and target

theories, differences in semantics and mechanism, historically specific assumptions, normative premises, objects absent from one framework, evidential differences, and the residual content that should remain untranslated.

This profile is especially important before the transition to neoclassical economics. Neoclassical theory will reorganize the analytical center around preferences, choice, marginal relations, scarcity, equilibrium, and welfare. Some classical problems survive that transition; others are reformulated, decomposed, or displaced. The dialogue is therefore best treated as a change in theoretical configuration rather than a simple replacement of an older theory by a newer one.

Proposition 21.243 (Classical translation-boundary condition). *A translation from classical political economy into another economic framework should be treated as partial whenever the target theory changes the relevant subject positions, value semantics, distributive mechanisms, temporal architecture, or institutional assumptions; preserved terminology alone is insufficient to establish equivalence.*

Section 21.13 turns to neoclassical economics. The transition will therefore examine not only which classical questions remain, but how a different theoretical configuration changes the objects, subjects, value architecture, coordination mechanisms, and standards of explanation through which those questions are posed.

21.13 Neoclassical Economics

This section continues the theory-specific dialogue by reconstructing neoclassical economics through preferences, choice, scarcity, marginal reasoning, equilibrium, and welfare. Its role is to identify the analytical architecture created by these concepts, the historical variations within that architecture, and the conditions under which its abstractions remain especially informative. The objective is comparative in method: the discussion treats Jevons, Menger, Walras, Marshall, Pareto, Robbins, Hicks, Samuelson, Arrow, and Debreu as contributors to a heterogeneous family of analytical developments whose internal differences remain part of the analysis. The section first examines the construction of preferences and choice, then scarcity and marginalism, followed by equilibrium and welfare, and concludes with a GRE relational reconstruction, a domain-of-adequacy assessment, and explicit translation limits. Table 21.13 summarizes the main dialogue coordinates.

Definition 21.244 (Neoclassical analytical configuration). *A neoclassical analytical configuration is a representation in which agents or decision units face feasible alternatives, order or evaluate those alternatives, respond to scarcity and constraints, make choices at relevant margins, and interact through price, market, or equilibrium relations whose welfare properties can be studied under stated assumptions.*

The definition identifies a family resemblance across distinct historical constructions. Early marginal utility theory, Marshallian partial equilibrium, Paretian ordinal analysis, Hicksian consumer theory, Samuelsonian formalization, and Arrow–Debreu general equilibrium differ in objects, mathematical commitments, temporal treatment, and standards of explanation (Jevons 1871; Menger 1871; Walras 1874; Marshall 1890; Pareto 1971; Hicks 1939b; Samuelson 1947; Arrow and Debreu 1954; Debreu 1959). Their dialogue with GRE should therefore proceed through particular

Table 21.13: Relational coordinates for neoclassical economics

Coordinate	Neoclassical analytical object	Dialogue boundary
Preferences	Ordering or evaluation of available alternatives	Historical and relational formation of wants, identities, and evaluative categories
Choice	Selection from a feasible set under constraints	Endogenous transformation of the chooser, the alternatives, and the feasible set
Scarcity	Limited means relative to competing uses or ends	Production, institutional creation, distribution, and relocation of scarcity
Marginalism	Incremental trade-offs, substitution, and local adjustment	Path dependence, discontinuity, threshold effects, and structural transformation
Equilibrium	Mutual consistency among plans, quantities, prices, or optimizing conditions	Equilibrium selection, adjustment processes, institutional reproduction, and open-ended change
Welfare	Efficiency and welfare comparison under specified informational and normative criteria	Distribution, capabilities, rights, power, plural value, and future-generation effects
Relational reconstruction	Coupling among agents, constraints, prices, exchanges, and feasible allocations	Treating relational translation as theoretical identity
Domain of adequacy	Problems where stable objects, preferences, constraints, and institutional rules are useful approximations	Settings with rapid endogenous change in units, relations, institutions, or value structures
Translation limit	Semantic, historical, normative, and dynamical remainder	Absorbing unresolved differences into GRE terminology

mechanisms and representational choices. A single image of “the neoclassical model” would erase analytically important differences among them.

Proposition 21.245 (Neoclassical reconstruction condition). *A relational reconstruction of neoclassical economics should preserve the analytical gains produced by explicit preferences or objectives, constraints, marginal trade-offs, price coordination, and equilibrium consistency while identifying separately the historical formation of agents, preferences, feasible sets, institutions, and future-generative consequences.*

21.13.1 Preferences

Preferences provide one of the principal interfaces between a decision unit and the alternatives available to it. Their analytical role changed substantially across the history grouped under neoclassical economics. Jevons formulated utility in explicitly marginal terms and connected exchange to the utility of incremental units (Jevons 1871). Menger also placed valuation in relation to human needs and available quantities, while developing a causal account of goods, value, exchange, and price that differs from Jevons’s mathematical construction (Menger 1871). Pareto and, later,

Hicks moved consumer theory toward ordinal representations in which the ranking of alternatives can carry the analytical work without requiring a cardinal measure of pleasure (Pareto 1971; Hicks 1939b).

This historical shift matters because “preference” can denote several different analytical objects. It may represent experienced valuation, an ordering inferred from choice, a stable modeling primitive, a local decision rule, or a reduced-form summary of influences that a model leaves outside its explicit structure. A relational dialogue should identify which meaning is operative before asking whether preferences correspond to GRE concepts of value, desire, orientation, or judgment.

Definition 21.246 (Preference representation profile). *A preference representation profile specifies the decision unit, the alternatives being ordered, the domain over which the ordering applies, the informational assumptions supporting the ordering, its temporal stability, its relation to observed choice, and the interpretation assigned to changes in that ordering.*

The profile separates two questions that are often conflated in cross-theoretical comparison. One concerns whether a preference representation is internally adequate for predicting or characterizing choice within a defined problem. The other concerns how the represented ordering arose. The first can often be answered without a theory of preference formation. The second may require psychology, sociology, institutions, culture, political economy, education, technology, or historical analysis.

GRE therefore has little reason to reject preference representations when they serve a well-defined local purpose. A household budget problem, a demand estimation exercise, or a mechanism-design problem may gain clarity from holding a preference ordering fixed over the relevant horizon. The additional GRE question concerns the conditions under which such stability is defensible. Advertising, social learning, platform interfaces, status competition, institutional classification, habit formation, technological substitution, or changes in capability can alter the field within which preferences are articulated. In those settings, the preference profile itself becomes part of the evolving economic configuration.

Proposition 21.247 (Preference-stability condition). *A preference representation can be treated as locally stable when the research horizon and mechanism of interest make changes in ordering, evaluative categories, and agent identity sufficiently small for the intended inference; otherwise preference formation should enter the explanatory architecture explicitly.*

The proposition is methodological in status and leaves the ultimate causal basis of preferences open. It identifies the burden of approximation. A model may legitimately abstract from preference formation, while a historical or generative explanation of the same setting may need to analyze that formation directly.

21.13.2 Choice

Choice converts an ordering of alternatives into a selected action, bundle, plan, or allocation under a specified opportunity structure. The analytical strength of neo-classical choice theory comes partly from the separation of three elements: what is feasible, how alternatives are evaluated, and what selection follows from their

conjunction. Samuelson's broader formal programme helped consolidate maximizing behavior and equilibrium reasoning within a common mathematical language (Samuelson 1947). Hicks's reconstruction of consumer theory similarly permits demand responses to be decomposed through ordered alternatives and changing constraints (Hicks 1939b).

The resulting architecture supports counterfactual analysis. If prices change while the represented ordering is held fixed, the analyst can study how the feasible set and selected bundle change. If income changes, another comparative exercise becomes possible. Comparable reasoning applies to firms, intertemporal plans, portfolios, production choices, and many other settings. The analytical gain derives from identifying which element changes and which elements are held stable for the comparison.

Definition 21.248 (Choice-configuration profile). *A choice-configuration profile specifies the decision unit, available alternatives, constraints, information, preference or objective representation, institutional decision rule, and temporal horizon that jointly determine the set of admissible selections under study.*

A GRE reconstruction adds a further distinction between *choice within a configuration* and *choice that changes the configuration*. Purchasing one bundle rather than another may leave the relevant decision architecture approximately intact. Other decisions alter future options, capabilities, dependencies, identities, institutional positions, or the categories through which subsequent alternatives are perceived. Education, migration, long-term contracts, platform adoption, infrastructure investment, care decisions, and irreversible ecological interventions often possess this second character.

This distinction can be expressed without weakening standard choice theory. The local choice problem remains useful, while its output can be treated as an input into a later configuration. A sequence of such choices may therefore require a history-bearing representation if earlier selections alter later feasible sets, information, preference formation, or bargaining positions.

Proposition 21.249 (Configuration-changing choice condition). *When a present selection materially changes later feasible sets, capabilities, preference formation, relational positions, or institutional rules, analysis should distinguish the local choice problem from the intertemporal transformation of the configuration in which subsequent choices occur.*

This proposition establishes a bridge between local choice analysis and analysis at the level of the configuration. Neoclassical choice analysis is especially precise when the configuration can be held sufficiently stable. GRE becomes more relevant when the consequences of choosing include changes in the architecture of later choice itself.

21.13.3 Scarcity

Scarcity supplies a formal reason why choice has opportunity cost. In Robbins's influential formulation, economics studies relations between ends and scarce means that have alternative uses (Robbins 1932). This conception is wider than physical shortage. A resource can be abundant in absolute quantity and remain scarce relative to competing uses, while a physically limited object may have little economic significance if

no competing claims are placed upon it.

The relational content of scarcity is therefore already substantial. Scarcity depends on a relation among means, ends, alternative uses, access, technology, institutional rights, and the relevant decision horizon. A change in any of these can alter effective scarcity. Innovation can expand usable means; law can change access; infrastructure can make a previously inaccessible resource available; monopoly can create exclusion; care obligations can make time scarce; digital replication can reduce one form of scarcity while increasing scarcity of attention, verification, or trustworthy judgment.

Definition 21.250 (Scarcity configuration). A *scarcity configuration* specifies the means under consideration, the competing uses or ends, the agents or positions with recognized claims, the technologies and institutions governing access, the relevant temporal horizon, and the opportunity costs generated by alternative deployment.

This definition permits a direct dialogue with GRE because it treats scarcity as a structured relation whose magnitude can change with uses, access, technology, institutions, and time. The further GRE inquiry concerns how scarcity is generated, maintained, relocated, or dissolved. A new technology may reduce the scarcity of computation while increasing electricity demand and dependence on specialized hardware. A licensing rule may create exclusive access to an otherwise reproducible informational good. A transport network may transform spatial scarcity by changing effective distance. An AI system may increase the supply of draft text while increasing the relative importance of trustworthy evaluation and problem selection.

Scarcity analysis can therefore be extended through a temporal question: what does an allocation do to the future scarcity configuration? Consumption may deplete a stock, investment may expand capacity, maintenance may preserve an infrastructure, and institutional change may alter access rules. These observations preserve scarcity as an analytical coordinate while making its generation and transformation an additional object.

Proposition 21.251 (Scarcity-transformation condition). *When present economic activity changes the quantity, accessibility, substitutability, institutional control, or future uses of relevant means, scarcity should be analyzed both as a current constraint and as an evolving configuration produced partly by prior economic action.*

The proposition is especially important for the later GRE research programme because the location of scarcity can move. Economic transformation may relax one bottleneck while creating another. A static measure of scarcity can remain correct for the initial period while becoming incomplete as an account of the process that generated the next period's opportunity structure.

21.13.4 Marginalism

Marginalism provides a disciplined language for incremental comparison. Jevons's "final degree of utility," Menger's valuation of quantities in relation to the satisfactions depending on them, Walras's treatment of rarity, exchange, and interdependent markets, and Marshall's joint analysis of demand and supply all make changes at the margin analytically central while differing in method and conceptual architecture (Jevons

1871; Menger 1871; Walras 1874; Marshall 1890). Marginal reasoning subsequently became a general technique for studying substitution, opportunity cost, factor use, demand response, production, and welfare.

Its strength is local discrimination. Total quantities can conceal the consequences of adding or subtracting a unit, relaxing a constraint, changing a price, or reallocating an input. Marginal reasoning makes these local trade-offs explicit. It is especially informative where changes are sufficiently small, alternatives are sufficiently comparable, and the surrounding structure varies smoothly enough for local relations to illuminate the relevant decision.

Definition 21.252 (Marginal comparison profile). A *marginal comparison profile* specifies the variable changed, the reference configuration, the size and direction of the change, the quantities or evaluations held fixed for the comparison, and the range over which the local relation is expected to remain informative.

GRE can preserve this local discipline while distinguishing it from structural transformation. Some economic changes accumulate approximately continuously. Others cross thresholds, create new categories, destroy complementarities, reorganize networks, trigger increasing returns, or change the institutional rule through which later margins are evaluated. Marshall's own treatment of time and equilibrium already warns against assuming that one market period can stand for every temporal horizon (Marshall 1890). A relational-generative analysis extends that caution to cases where the relevant configuration changes qualitatively.

The distinction is particularly useful for policy analysis. A small tax change within an established market may be well studied through marginal responses. A reform that creates a new property regime, platform architecture, care infrastructure, or technological standard may change the set of actors, relations, and feasible actions. Local comparative statics can still contribute, while the overall explanation requires a representation of the structural change.

Proposition 21.253 (Marginal-domain condition). *Marginal reasoning has greatest explanatory force where local changes preserve the identity and relevant structure of the comparison domain; threshold crossing, endogenous category formation, and structural reconfiguration require additional analysis of the altered domain in which later margins are defined.*

The proposition therefore assigns marginalism a clear domain of analytical strength. It also prevents a converse error in which every local adjustment is redescribed as a large relational transformation. GRE needs marginal reasoning precisely because generative processes also contain many locally incremental decisions.

21.13.5 Equilibrium

Equilibrium organizes interdependence. In Walrasian analysis, prices and quantities across markets are connected through simultaneous conditions that make their mutual dependence explicit (Walras 1874). Marshall develops a different equilibrium architecture centered on partial analysis and the importance of market period and time horizon (Marshall 1890). Arrow and Debreu later provide a rigorous existence result for competitive equilibrium in an integrated model of production, exchange, and con-

sumption under explicit assumptions, while Debreu's axiomatic treatment separates commodities, producers, consumers, equilibrium, optimum, and uncertainty with exceptional formal clarity (Arrow and Debreu 1954; Debreu 1959).

The concept therefore carries several meanings across the tradition. It can denote market clearing, mutual consistency of plans, an optimizing condition, a temporary balance, or a solution to a system of interdependent relations. Theoretical dialogue requires the equilibrium concept to be specified before interpreting its economic significance.

Definition 21.254 (Equilibrium representation profile). *An equilibrium representation profile specifies the agents and markets included, the variables required to be mutually consistent, the behavioral and technological assumptions, the institutional rules generating interaction, the temporal interpretation, the conditions supporting existence or local determination, and the adjustment process when such a process forms part of the model.*

One major contribution of equilibrium analysis is that it constrains partial explanations. A proposed change in one market can affect demands, supplies, incomes, input prices, and opportunities elsewhere. General equilibrium formalizes this interdependence; partial equilibrium deliberately narrows it when cross-market effects can be held secondary for the problem at hand. Both are relational in a limited but important sense because an outcome is defined through consistency among connected decisions and constraints.

GRE introduces a separate question concerning the relation between equilibrium and historical reproduction. A configuration may satisfy an equilibrium condition while depending on institutions, norms, infrastructures, legal rights, ecological inputs, care work, or political settlements that the equilibrium representation holds fixed. Conversely, a history-bearing system may remain far from a stable equilibrium while displaying persistent institutions or recurrent patterns. Equilibrium therefore identifies one kind of relational consistency; it does not by itself classify every form of persistence or change.

Proposition 21.255 (Equilibrium–reproduction distinction). *An equilibrium condition establishes mutual consistency relative to the variables and assumptions represented in the model; an account of economic reproduction additionally requires analysis of the processes that sustain, modify, or replace the institutions, resources, capabilities, and relations treated as given by that representation.*

This distinction preserves the formal achievement of equilibrium theory while preventing equilibrium from becoming a synonym for social stability. It also creates a useful interface with later complexity, evolutionary, institutional, and historical approaches, each of which will interpret persistence and transformation differently.

21.13.6 Welfare

Welfare economics studies the evaluative properties of allocations and changes in allocations. Pareto's framework provides an especially influential efficiency criterion: an allocation can be assessed through the possibility of improving at least one person's position without worsening another's, while the criterion itself leaves many dis-

tributive comparisons unresolved (Pareto 1971). Pigou develops a broader welfare-economic programme that connects economic welfare to the national dividend and analyzes divergences between private and social net product (Pigou 1920). Hicks and Kaldor later formulate compensation-based criteria that seek to extend welfare comparison while limiting reliance on direct interpersonal cardinal utility comparisons (Hicks 1939a; Kaldor 1939). Debreu's treatment of optimum and equilibrium further clarifies the formal relation between feasible allocations and welfare properties under specified assumptions (Debreu 1959).

These developments reveal an important disciplinary virtue: efficiency claims can be separated from broader normative conclusions. A Pareto-efficient allocation can coexist with highly unequal endowments or capabilities. A compensation test can identify potential gains while leaving the actual distribution of gains and losses unsettled. External effects can create divergences between private incentives and social consequences. Welfare analysis therefore supplies criteria with distinct informational and normative scopes, leaving wider social ranking to additional premises.

Definition 21.256 (Welfare-evaluation profile). *A welfare-evaluation profile specifies the persons or units whose positions count, the welfare or preference information admitted, the feasible alternatives, the efficiency or comparison criterion, the treatment of distribution and external effects, and the normative claims that the criterion is intended to support.*

GRE can use this discipline when developing generative evaluation. A claim that an allocation creates future options, strengthens relational infrastructure, improves capabilities, or regenerates ecological conditions still requires a rule specifying whose opportunities count, over what horizon, according to which value dimensions, and with what treatment of conflicts among them. Heterogeneous generative value does not remove the need for evaluative criteria. It makes the plurality and conversion structure of those criteria more explicit.

The dialogue also exposes a temporal extension. Conventional welfare comparison often evaluates alternative allocations or states at a given analytical level. GRE asks how current allocations alter future evaluative capacity, future feasible sets, and the relations through which later value is generated or captured. This creates questions about intergenerational effects, capability formation, irreversible losses, and path-dependent value conversion. Such questions can sometimes be represented within extended welfare models; in other cases they require additional theoretical machinery.

Proposition 21.257 (Welfare-scope condition). *A welfare criterion should be interpreted within the information, population, temporal horizon, distributional treatment, and value dimensions that it explicitly admits; broader claims about justice, capability, relational sustainability, or future generativity require additional premises and evidence.*

The proposition reinforces a point central to Chapter 21: theoretical limitation is not equivalent to theoretical failure. A deliberately narrow welfare criterion can be highly useful when its scope is kept visible. Problems arise when a local criterion is silently expanded into a complete social evaluation.

21.13.7 Relational Reconstruction

The preceding concepts can be reconstructed relationally without converting neo-classical economics into GRE. Preferences relate decision units to alternatives; constraints relate intended actions to available means; prices relate dispersed plans through exchange; budget sets relate endowments and prices to feasible consumption; production possibilities relate technologies and resources to output; equilibrium relates multiple plans through consistency conditions; and welfare criteria relate feasible states through evaluative rules. The neoclassical architecture is therefore already rich in formally specified relations.

The difference concerns which relations are internal to the model and which are held outside it. A standard consumer problem may represent the relation among preferences, prices, income, and chosen bundles with great precision while leaving preference formation, legal personhood, household bargaining, cultural meaning, or future capability effects outside the active explanatory frame. A general-equilibrium model can represent economy-wide price interdependence while holding institutions, commodity definitions, property rights, or technological possibilities sufficiently fixed for the theorem or exercise at hand.

Definition 21.258 (Neoclassical relational-reconstruction profile). A *neoclassical relational-reconstruction profile* maps decision units, preference or objective representations, constraints, endowments, technologies, prices, exchanges, equilibrium conditions, and welfare criteria into an explicit relational configuration while recording the historical, institutional, and generative conditions held outside that configuration.

This reconstruction yields several contributions to GRE. First, neoclassical theory supplies disciplined methods for specifying trade-offs and thereby constrains any use of generativity as an economic good. Second, it requires opportunity costs to be made visible. Third, equilibrium analysis disciplines claims about interdependence. Fourth, welfare economics demonstrates the importance of separating efficiency from wider normative evaluation. Fifth, axiomatic formalization shows how strong results can be tied explicitly to assumptions rather than embedded in suggestive prose.

GRE adds a complementary layer by asking how the inputs to these models become generated. Endowments emerge from histories of acquisition and inheritance; technologies arise through investment, learning, institutions, and knowledge; preference orderings can be shaped through social relations and infrastructures; market boundaries are institutionally constituted; commodity categories can be transformed; and allocations alter future capacities and constraints. These questions can be studied alongside neoclassical models within a plural formal architecture.

Proposition 21.259 (Relational extension condition). A *GRE extension of a neoclassical model is warranted when the mechanism of interest depends materially on the generation or transformation of agents, preferences, constraints, endowments, technologies, institutional rules, or future opportunity structures that the original model holds fixed*.

The condition prevents indiscriminate extension. Additional relational detail carries analytical cost. When fixed primitives are empirically adequate over the relevant horizon, retaining them can improve clarity. When they are themselves central

causal objects, treating them as exogenous can hide the process the inquiry seeks to explain.

21.13.8 Domain of Adequacy

The dialogue requires a positive account of where neoclassical abstractions are especially effective. Their domain of adequacy is strongest when the research question concerns trade-offs among identifiable alternatives, responses to prices or constraints, substitution among uses, decentralized coordination, market interdependence, or welfare properties of clearly specified allocations. The relevant agents, commodities, technologies, preferences or objectives, and institutional rules need sufficient local stability for these abstractions to isolate the mechanism under study.

Definition 21.260 (Neoclassical domain-of-adequacy profile). *A neoclassical domain-of-adequacy profile specifies the empirical and analytical conditions under which stable decision units, ordered alternatives, explicit constraints, marginal responses, and equilibrium or welfare concepts provide a sufficiently accurate representation for the research question and time horizon at issue.*

Several kinds of inquiry fit this profile well. Demand responses to price changes can often be represented through constrained choice. Firms' local substitution among inputs can be studied through marginal conditions. Auction or mechanism problems can benefit from explicit incentive and feasibility structures. Competitive-equilibrium models can clarify the consistency requirements connecting many markets. Welfare analysis can identify efficiency properties and expose the normative information absent from an efficiency criterion. These achievements remain valuable even when a broader historical explanation is also required.

The domain profile should be assessed through empirical and theoretical fit to the research question. A problem situated inside a rapidly changing digital platform may still contain a stable local pricing problem. A historically institutional inquiry may still need a neoclassical model of a particular margin. Conversely, a familiar market setting may fall outside a simple neoclassical representation when preferences, product categories, market rules, or strategic power are changing endogenously over the relevant horizon.

Proposition 21.261 (Local-adequacy condition). *A neoclassical representation is locally adequate when transformations omitted for analytical tractability remain sufficiently limited that they do not materially alter interpretation of the result within the stated horizon and population.*

This condition also disciplines GRE. A relational-generative model should earn its additional complexity. Where a simpler model captures the mechanism with sufficient accuracy, a larger ontology of relations can reduce interpretability without improving inference. GRE's open research programme therefore benefits from treating neoclassical models as reusable analytical components whose adequacy can be tested locally.

21.13.9 Limits of Translation

Translation between neoclassical economics and GRE encounters semantic, historical, formal, and normative remainders. Preference and value, utility and well-being, equilibrium and relational sustainability, capital and generative capacity, efficiency and justice, and allocation and generative configuration occupy different theoretical roles. A particular inquiry may establish partial correspondence between members of these pairs only after the relevant assumptions and semantic changes are stated explicitly.

The historical remainder is equally important. “Neoclassical economics” covers transformations extending from nineteenth-century marginalism through twentieth-century formal choice, equilibrium, and welfare theory. A GRE translation that projects contemporary meanings of preference, optimization, or equilibrium onto Jevons, Menger, Walras, or Marshall would obscure differences that are themselves analytically useful. The reverse risk also exists: criticism of an early utility formulation should not be transferred without qualification to ordinal preference theory or axiomatic general equilibrium.

Definition 21.262 (Neoclassical translation-boundary profile). A *neoclassical translation-boundary profile* records the concepts and mechanisms that admit structural correspondence with GRE, the assumptions required for that correspondence, the semantic and historical remainders that resist translation, and the changes in normative or empirical meaning introduced by the target framework.

Several translation boundaries deserve explicit preservation. A stable preference ordering is a useful analytical primitive even when GRE studies how preferences form. Pareto efficiency remains a precise property even when GRE asks additional questions about capability, power, or future options. Competitive equilibrium can establish consistency and welfare results under its assumptions even when the institutional conditions supporting those assumptions require separate explanation. Marginal reasoning can remain valid locally within a process that also contains discontinuities and structural change.

Theoretical dialogue therefore works best through layered explanation. A neoclassical model can analyze a local choice, allocation, or equilibrium relation. Historical and institutional inquiry can explain how the relevant market and rights were constituted. Behavioral analysis can study departures from the assumed decision structure. GRE can examine how the combined configuration generates later capabilities, dependencies, values, and constraints. These layers may overlap without collapsing into one another.

Proposition 21.263 (Neoclassical translation-restraint condition). A *translation between neoclassical economics and GRE should remain partial whenever correspondence depends on changing the meaning of preference, utility, scarcity, capital, equilibrium, efficiency, welfare, or allocation; the residual difference should remain visible as theoretical information and should resist purely terminological resolution.*

The neoclassical dialogue therefore contributes both analytical tools and boundary conditions to GRE. It supplies precise languages for constrained choice, scarcity, marginal trade-offs, interdependence, equilibrium, and welfare. GRE contributes questions about the historical production of the modeled primitives, the transforma-

tion of relational configurations, heterogeneous generative value, power over conversion and opportunity structures, and the future consequences of present allocation. Section 21.14 turns next to Marxian political economy, where production, class relations, value, accumulation, exploitation, crisis, and historical transformation reorganize the comparative coordinates in a substantially different way.

21.14 Marxian Political Economy

This section continues the theory-specific dialogue by reconstructing Marxian political economy through relations of production, class, value, exploitation, accumulation, crisis, and historical materiality. Its role is to identify the relational architecture distinctive to Marx's critique of political economy while preserving the diversity of later Marxian interpretations. The objective is interpretive and comparative: the discussion begins with Marx's historically specific analysis of capitalist production and then uses Rubin, Luxemburg, Postone, Harvey, Vogel, Fraser, and other later developments where they clarify distinct extensions while preserving the internal heterogeneity of Marxian political economy. The section first examines production relations and class positions, then value and exploitation, followed by accumulation, crisis, and historical materiality, and concludes with a GRE relational reconstruction and explicit translation limits. Table 21.14 summarizes the principal dialogue coordinates.

Definition 21.264 (Marxian political-economic configuration). A *Marxian political-economic configuration* is a historically situated representation in which production is organized through definite social relations, subjects occupy positions within those relations, commodities and capital carry specific social forms, surplus is produced and appropriated through the organization of labor, accumulation reproduces and transforms the configuration, and contradictions can generate recurrent pressures toward restructuring or crisis.

The definition identifies a family of analytical commitments with substantial internal variation. Marx's mature critique places commodity production, wage labor, capital, value, surplus value, accumulation, and historical transformation within a connected architecture (Marx 1859; Marx 1867; Marx 1993). Later Marxian traditions disagree about the interpretation of value, the status of historical materialism, the mechanisms of crisis, the role of class agency, the significance of social reproduction, and the scale at which capitalist dynamics should be reconstructed (Rubin 1972; Postone 1993; Luxemburg 2003; Harvey 1982; Vogel 1983; Fraser 2014). Those disagreements remain part of the object of dialogue.

Proposition 21.265 (Marxian reconstruction condition). A *relational reconstruction of Marxian political economy* should preserve the historical specificity of capitalist social forms, the distinction between material processes and their social organization, the relational derivation of class and exploitation, and the endogenous connection among production, circulation, reproduction, accumulation, and transformation.

Table 21.14: Relational coordinates for Marxian political economy

Coordinate	Marxian analytical object	Dialogue boundary
Relations of production	Historically specific organization of production, control, appropriation, and reproduction	Reduction of production relations to technology, legal ownership, or generic interaction
Class	Structural positions reproduced through production, property, labor, and appropriation relations	Translation of class into income rank, identity, or generic network position
Value	Social form of commodity-producing labor and its socially necessary temporal mediation	Identification with general worth, welfare, price, or heterogeneous generative value
Exploitation	Production and appropriation of surplus value through the wage-labor-capital relation	Identification with every asymmetry, dependency, injustice, or unequal outcome
Accumulation	Reinvestment and expanded reproduction of capital through recurrent production and circulation	Identification with simple asset growth or with generativity in every value domain
Crisis	Disruption emerging from historically specific tensions in reproduction, circulation, realization, finance, profitability, or accumulation	Treatment of one crisis mechanism as exhaustive across Marxian traditions
Historical materiality	Historical generation and transformation of social forms through material production and social relations	Mechanical technological determinism or ontological closure
Relational reconstruction	Coupling of social forms, positions, processes, reproduction, and historical transformation	Absorption of Marxian categories into generic relational vocabulary
Translation limit	Semantic, historical, normative, and causal remainder between Marxian and GRE categories	Theoretical identity inferred from structural resemblance

21.14.1 Relations of Production

Relations of production provide a primary organizing coordinate for Marxian political economy. In the 1859 *Critique*, Marx describes social production as occurring through definite relations corresponding to historically situated productive forces and treats the totality of those relations as constitutive of an economic structure (Marx 1859). *The German Ideology* similarly connects material production, division of labor, forms of property, productive forces, and historically changing social relations (Marx and Engels 1970). In *Capital*, the analysis becomes more specific to capitalist production: owners of money and means of production encounter sellers of labor-power within commodity exchange, and the production process reproduces the social conditions through which capital and wage labor persist (Marx 1867).

The phrase *relations of production* therefore refers to more than interpersonal connection. It identifies patterned social positions and rules through which productive activity is organized, means of production are controlled, labor is mobilized, outputs are appropriated, and the conditions of subsequent production are reproduced. Property relations are important because they help constitute these positions, while legal ownership alone does not exhaust the economic relation. Technology also matters because productive forces condition feasible forms of organization, yet a machine, factory, or digital infrastructure acquires different economic significance under different control, labor, and appropriation relations.

Definition 21.266 (Production-relations profile). A *production-relations profile* specifies the direct producers, controllers of means of production, labor-mobilization mechanisms, decision rights, appropriation rules, coordination forms, juridical expressions, and reproductive conditions through which material production acquires a historically specific social form.

This profile helps separate material-technical content from social form, a distinction emphasized strongly in Rubin's reconstruction of Marxian political economy (Rubin 1972). A production technology may remain materially similar while the social relations governing access, control, remuneration, and disposition of output change. Conversely, technological transformation may alter the viable range of social organization, bargaining positions, skill structures, or dependence without mechanically determining one institutional result.

The distinction has direct relevance to GRE. GRE also studies relations that condition access, capability, control, and future formation. Marxian production relations add a sharper historical and economic specification: the relation is analytically significant because it structures production and reproduction within a particular mode of economic organization. A GRE reconstruction should therefore retain the typed content of the relation when representing connections between economic subjects.

Proposition 21.267 (Typed production-relation condition). A *Marxian production relation* should be reconstructed through its historically specific control, labor, appropriation, and reproductive functions; relational connectivity by itself does not preserve the theoretical content of the category.

This condition is especially important for contemporary extensions. Platform labor, algorithmic management, intellectual property, data infrastructures, global supply chains, and highly automated production can change the material and organizational form through which control is exercised. A Marxian analysis can remain informative when it asks how these changes reorganize access to productive assets, labor-power, surplus appropriation, and reproduction. GRE can add questions concerning generative capability, epistemic infrastructure, heterogeneous value, and future-option formation without replacing the original production-relations problem.

21.14.2 Class

Class in Marxian political economy is anchored in relational position. In *Capital*, the wage-labor–capital relation depends on historically constituted conditions under which labor-power appears as a commodity and means of production confront workers as capital (Marx 1867). Class analysis therefore concerns recurrent positions

within production, property, appropriation, and reproduction; an income partition captures only one possible manifestation of those positions. The material resources attached to a position remain important, yet their significance is mediated by the rights, dependencies, and productive relations through which they can be used.

A class position also has a reproductive dimension. Wage earners ordinarily reproduce access to subsistence through the sale of labor-power, while owners or controllers of capital reproduce their position through command over assets, investment, appropriation, and accumulation. These positions can contain substantial internal differentiation. Occupation, authority, skill, household structure, legal status, geography, race, gender, and institutional setting can modify how a class relation is experienced and reproduced. Marxian class analysis therefore supports a structural coordinate without requiring social life to be exhausted by one binary classification.

Definition 21.268 (Marxian class-position profile). *A Marxian class-position profile specifies a subject's recurrent position in relation to productive assets, labor-power, decision authority, appropriation of product or surplus, dependence on market participation, and the mechanisms through which that position is reproduced across time.*

The profile distinguishes class from identity and from distributive outcome. Persons with similar incomes can occupy different relations to productive assets and labor. Persons within a similar structural class position can possess different identities, capabilities, and political orientations. Class consciousness, organization, and collective agency constitute further questions that cannot be inferred automatically from the economic position itself. Later Marxian traditions have developed those questions in different directions, which reinforces the value of keeping structural position, lived experience, and political agency analytically distinguishable.

Rubin's account of the personification of economic categories offers a useful bridge for relational analysis: owners of particular economic objects can occupy social functions because those objects mediate determinate production relations (Rubin 1972). The analytical point concerns the patterned constraints and enablements attached to roles through institutionalized relations among persons and things, while persons retain characteristics and capacities exceeding those roles.

Proposition 21.269 (Class-position distinction). *A class position provides a structural description of recurrent relations to production and appropriation; claims about identity, consciousness, organization, or political action require additional evidence concerning how subjects interpret, inhabit, and coordinate within those positions.*

GRE can extend this architecture by examining how class position intersects with capabilities, care dependence, epistemic access, platform mediation, environmental exposure, and intergenerational opportunity. Such extensions remain analytically useful when they preserve class as a typed economic relation and treat broader disadvantage through additional concepts.

21.14.3 Value

Value is one of the most difficult translation coordinates between Marxian political economy and GRE because the word carries substantially different meanings

across traditions. In *Capital*, Marx's analysis begins from the commodity and distinguishes use-value, exchange relations, and value while developing abstract labor and socially necessary labor time as categories specific to generalized commodity production (Marx 1867). Rubin emphasizes the social-form dimension of this theory: value expresses a production relation among commodity producers that assumes an objective form through things, and the theory concerns the social organization of labor, while a purely physical quantity contained inside commodities would omit that social mediation (Rubin 1972).

This distinction matters because a crude translation of Marxian value into "labor embodied" loses the mediation that gives the category its social meaning. Private labors become socially validated through a commodity-producing system in which products confront one another as values. The magnitude and form of value therefore concern the organization and social equalization of labor within a specific economic structure, not a general theory of everything people regard as valuable.

Definition 21.270 (Marxian value-form profile). A *Marxian value-form profile* specifies the commodity form, the historically specific organization of labor, the mediation through which heterogeneous concrete labors acquire an abstract social relation, the temporal standard relevant to socially necessary labor, and the monetary or exchange forms through which value becomes manifest.

Postone develops one influential later reconstruction by treating value, abstract labor, and abstract time as historically specific forms of social mediation that help generate capitalism's distinctive temporal dynamic (Postone 1993). This interpretation is not interchangeable with every Marxist labor theory of value, yet it highlights an issue highly relevant to GRE: a measure can participate in social constitution while also serving descriptive purposes. When production is organized through value-mediated competition, socially necessary time can discipline producers, technologies, and investment decisions even though no single actor directly plans the total social allocation of labor.

GRE's concept of heterogeneous value operates at another level. It examines plural forms of value, conversion, circulation, capture, dissipation, and regeneration across economic and relational domains. Marxian value should therefore enter GRE as a historically specific social form with a narrower scope than value in general. Use-value, price, exchange-value, surplus value, welfare, capability, ecological value, care value, and generative value can interact while retaining distinct theoretical roles.

Proposition 21.271 (Value-translation restraint). *Marxian value should be translated into GRE only at the level supported by the specific inquiry; correspondence with labor mediation, temporal discipline, commodity form, or monetary manifestation does not establish identity with heterogeneous value, normative worth, welfare, or generative value.*

This restraint preserves a productive asymmetry between the frameworks. Marxian value theory offers GRE a powerful account of how social relations can acquire objective economic form through commodity mediation. GRE offers a wider architecture for examining value domains and conversion relations that Marxian value theory was not designed to classify exhaustively.

21.14.4 Exploitation

Exploitation in Marx's mature political economy is derived through the distinction between labor and labor-power and through the production of surplus value. The worker sells labor-power as a commodity for a period, while the use of that labor-power in production can generate value beyond the value required for its reproduction (Marx 1867). This construction gives exploitation a precise structural location: the decisive relation lies in production, even when labor-power and other commodities exchange through market forms that satisfy the exchange rules assumed by the analysis.

The category therefore differs from a general description of unfairness. A low wage, harsh working condition, unequal bargaining position, or distributive inequality may accompany exploitation and can intensify its consequences, while the Marxian derivation turns on the production and appropriation of surplus value through a historically specific wage-labor relation. Normative criticism can be built around that structure, yet the analytical category has content before a complete normative theory is supplied.

Definition 21.272 (Marxian exploitation profile). *A Marxian exploitation profile specifies the purchase and use of labor-power, the conditions reproducing labor-power, the labor process through which new value is produced, the division between necessary and surplus labor in the relevant theoretical representation, the appropriation of surplus value, and the institutional relations reproducing that arrangement.*

This profile clarifies the relation between exploitation and power. Power can shape the conditions under which labor contracts are formed, work is organized, technologies are introduced, workplaces are governed, and alternatives are available. Marxian exploitation identifies a more specific surplus-producing relation within that wider power architecture. GRE can therefore model exploitation as one typed mechanism through which relational asymmetry and control affect value production and capture while preserving other forms of power that do not pass through wage labor.

The same distinction matters for non-wage forms of extraction. Rent, debt service, monopoly pricing, unpaid care work, platform fees, data appropriation, ecological externalization, and colonial or geopolitical transfers may involve important forms of capture or domination. Some Marxian traditions incorporate such processes into expanded accounts of capitalism, and social-reproduction approaches have emphasized the reproduction of labor-power beyond the immediate wage relation (Vogel 1983; Fraser 2014). Analytical expansion remains strongest when the mechanism of each transfer is stated explicitly and its relation to the wider capitalist configuration is demonstrated.

Proposition 21.273 (Exploitation–power distinction). *Marxian exploitation identifies a historically specific relation between labor-power, value production, and surplus appropriation, while relational power encompasses a wider class of mechanisms through which asymmetries alter action, dependence, conversion, and future opportunity.*

The distinction allows GRE to learn from the precision of the surplus-value mechanism while retaining a broader vocabulary for power, care, ecology, platform control, epistemic dependence, and other relations whose causal structure may differ.

21.14.5 Accumulation

Accumulation connects surplus appropriation to the reproduction and expansion of capital. Marx analyzes accumulation as the reconversion of surplus value into capital and links this process to enlarged production, changes in productivity, labor demand, concentration, and the changing composition of capital (Marx 1867). Volume II extends the analysis through the circuits and turnover of money-capital, productive capital, and commodity-capital and through schemes of simple and expanded reproduction at the level of total social capital (Marx 1993).

Accumulation is consequently a recursive process. The outcome of one production cycle changes the resources, technologies, organizational capacities, and competitive pressures entering later cycles. Capital acts simultaneously as a stock represented in assets and money, a social relation organizing production, and a process whose continuation depends on recurrent circulation and realization. A disruption in one circuit can therefore propagate into investment, employment, production, credit, or demand in another part of the configuration.

Definition 21.274 (Marxian accumulation profile). *A Marxian accumulation profile specifies the generation of surplus value, its realization and appropriation, the share converted into additional capital, the productive and financial forms through which reinvestment occurs, the labor and resource conditions enabling expansion, and the structural transformations produced by repeated reproduction on an enlarged scale.*

Later Marxian analyses extend this architecture across different scales. Luxemburg examines accumulation through realization and the relation between capitalist and non-capitalist environments (Luxemburg 2003). Harvey emphasizes turnover, fixed capital, credit, geographical expansion, and built environments that can facilitate accumulation while creating later rigidities and spatial tensions (Harvey 1982). These accounts should be treated as theoretically distinct developments with different accumulation and crisis mechanisms.

GRE gains an important lesson from this recursive architecture: present appropriation and investment alter the future structure in which later economic action occurs. Accumulation can expand productive capability, infrastructure, knowledge, and coordination capacity. It can also deepen dependence, concentrate control, exhaust ecological conditions, displace reproductive labor, or narrow future options. The term *generativity* therefore adds an evaluative and multi-domain question that cannot be inferred from the magnitude of accumulated capital alone.

Proposition 21.275 (Accumulation–generativity distinction). *Capital accumulation establishes a recursive process of surplus realization, reinvestment, and expanded reproduction within a capitalist configuration; claims about broader generativity require additional analysis of capability, relational, ecological, epistemic, distributive, and future-option effects.*

This proposition creates a useful interface with earlier GRE chapters on conversion and capture. Accumulation can be represented as one family of conversion loops in which value produced in one phase becomes command over resources and productive conditions in a later phase. The Marxian account adds historically specific institutions and class relations to that loop, preventing a generic flow representation from obscuring who controls conversion and under what social conditions.

21.14.6 Crisis

Crisis analysis in Marxian political economy is better represented as a family of mechanisms than as one universally agreed theory. Marx's analyses of circulation, turnover, reproduction, competition, accumulation, and realization identify several sites at which the reproduction of capital can encounter disruption (Marx 1867; Marx 1993). Later Marxian traditions have developed different emphases, including realization problems, disproportionality, overaccumulation, profitability pressures, credit dynamics, financial fragility, spatial displacement, and conflicts between accumulation and its social or ecological conditions (Luxemburg 2003; Harvey 1982; Fraser 2014).

The shared analytical intuition is relational: crisis emerges through incompatibility or interruption among processes that are individually connected to reproduction. Production can expand while realization lags. Credit can bridge temporal gaps while increasing future obligations. Fixed capital can support productivity while binding investment to spatial and technological configurations. Competitive pressures can induce productivity-enhancing investment while altering employment, demand, profitability, or the valuation of existing capital. Social reproduction and ecological conditions can sustain accumulation while being degraded by the pressures placed upon them.

Definition 21.276 (Marxian crisis-mechanism profile). *A Marxian crisis-mechanism profile specifies the reproduction processes involved, the relation or temporal coupling that becomes strained, the mechanism through which incompatibility accumulates or propagates, the trigger or threshold associated with disruption, and the restructuring process through which the configuration is restored, transformed, or displaced.*

This definition keeps crisis historically and mechanism-specific. A fall in asset prices, a banking panic, a profitability squeeze, a realization failure, a supply interruption, and a social-reproductive breakdown can interact while remaining different causal objects. The analyst therefore gains more explanatory precision by specifying the pathway than by treating crisis as a self-explanatory category.

GRE's work on criticality creates an obvious comparison, yet translation requires restraint. Criticality refers to dynamical conditions in which relatively small perturbations can produce large configurational changes under specified models or empirical indicators. Marxian crisis concepts concern historically structured contradictions, reproduction problems, and restructuring mechanisms. A crisis can occur without evidence that a system was near a mathematically defined critical point, and a near-critical system need not instantiate a Marxian accumulation contradiction.

Proposition 21.277 (Crisis-plurality condition). *A Marxian crisis explanation should identify the reproduction mechanism, temporal coupling, propagation pathway, and historical conditions relevant to the case; the existence of recurrent capitalist crises does not establish one exhaustive causal mechanism across periods and scales.*

The proposition also disciplines GRE. Concepts such as threshold, attractor, fragility, and critical transition can clarify particular crisis processes only where their formal and empirical assumptions are satisfied. Marxian crisis analysis can contribute historical and institutional specification to those dynamical models, while

dynamical analysis can help separate mechanisms that otherwise remain grouped under broad crisis terminology.

21.14.7 Historical Materiality

Historical materiality gives Marxian political economy its distinctive temporal depth. Marx's 1859 formulation links productive forces, relations of production, legal and political forms, and historically changing modes of production, while *The German Ideology* develops history through real individuals, material production, division of labor, property, and changing forms of social intercourse (Marx 1859; Marx and Engels 1970). These arguments direct attention toward the material and relational conditions through which social forms become possible, reproduce themselves, and eventually undergo transformation.

The relationship among productive forces, production relations, institutions, consciousness, and agency has generated substantial disagreement within Marxian scholarship. Structural readings have emphasized the relatively organized effects of social structures; analytical reconstructions have sought explicit explanatory mechanisms; historical and humanist critiques have emphasized experience, agency, and empirical process. These differences can be seen in the divergent reconstructions associated with Althusser, Cohen, and Thompson (Althusser 2006; Cohen 2001; Thompson 1978). The diversity cautions against reducing historical materialism to a single technological or deterministic proposition.

Definition 21.278 (Historical-materiality profile). A *historical-materiality profile* specifies the productive capacities, social relations, institutions, material dependencies, forms of consciousness, conflicts, and temporal sequences through which an economic configuration is reproduced and transformed, together with the causal claims linking these elements in the interpretation at issue.

Postone's reconstruction adds a further dimension by treating capitalism's basic categories as historically specific forms of social mediation whose scope is tied to capitalist social relations (Postone 1993). This emphasis is important for GRE because it aligns with the principle that analytical categories themselves can be historically generated. "Labor," "capital," "commodity," "market," or "value" should therefore be assigned the scope established by the social relations that make the category operative.

GRE can adopt historical sensitivity without adopting a fixed philosophy of historical succession. Ontological suspension leaves open the ultimate status of material, relational, symbolic, and institutional realities. Historical explanation can still examine how material constraints, technologies, property forms, political institutions, ecological conditions, knowledge, and social relations jointly condition later possibilities.

Proposition 21.279 (Historical-materiality restraint). A GRE translation of historical materiality should preserve the historically specific coupling among material production, social relations, institutions, and transformation while leaving stronger claims of technological determination, necessary stage succession, or ultimate ontology to the evidence and argument of the particular Marxian interpretation.

This restraint makes Marxian historical analysis especially useful as a corrective to timeless economic categories. It also leaves room for contingency. Historically generated structures can constrain action strongly while remaining dependent on political conflict, institutional experimentation, ecological conditions, technological change, and collective agency whose outcomes are not fully fixed in advance.

21.14.8 Relational Reconstruction

Marxian political economy admits a particularly rich relational reconstruction because many of its central categories are defined through relations among historically positioned subjects, things, and processes. Capital depends on recurrent relations among money, commodities, labor-power, production, circulation, appropriation, and reinvestment. Class positions arise through relations to productive assets and labor. Value is mediated through a social organization of commodity-producing labor. Exploitation is generated through a relation between labor-power and surplus production. Accumulation recursively transforms the configuration that supports later accumulation. Crisis concerns disturbances in the reproduction of these connected processes.

Definition 21.280 (Marxian relational-reconstruction profile). A *Marxian relational-reconstruction profile* maps production relations, class positions, commodity and value forms, labor-power, surplus production, circulation, accumulation, reproduction, institutional conditions, and historical transformation into a connected configuration while retaining the historical specificity and causal semantics of the Marxian categories.

Several contributions to GRE follow from this reconstruction. First, Marxian analysis shows how apparently thing-like economic categories can express social relations. Rubin's social-form interpretation is especially useful here because it directs analysis from the material appearance of value, money, capital, profit, rent, or wages toward the production relations expressed through those forms (Rubin 1972). GRE's distinction between manifestation and relational reality can learn from this methodological move while maintaining its own ontological restraint.

Second, Marxian political economy integrates production and reproduction. Economic activity reproduces material outputs and can reproduce the relations, positions, institutions, and dependencies through which subsequent activity is organized. Volume II's circuits and reproduction schemes provide a particularly clear economic representation of this recursive structure (Marx 1993). GRE can generalize the question toward capability, ecological, epistemic, institutional, and relational reproduction without assuming that each domain follows the value logic of capital.

Third, Marxian analysis treats accumulation as a process that can transform the conditions of subsequent reproduction. Competitive pressure, technical change, concentration, spatial organization, and changing labor relations can transform the environment in which later decisions occur (Marx 1867; Harvey 1982). This complements GRE's emphasis on history-bearing economic configurations and path-dependent future formation.

Fourth, later social-reproduction and expanded-capitalism approaches identify background relations whose maintenance supports production and accumulation.

Vogel centers the reproduction of labor-power, while Fraser analyzes social reproduction, ecology, and public power as enabling conditions that can be destabilized by accumulation dynamics (Vogel 1983; Fraser 2014). These developments create direct interfaces with GRE's work on care, relational infrastructure, ecological regeneration, and institutional maintenance.

Definition 21.281 (Marxian domain-of-adequacy profile). A *Marxian domain-of-adequacy profile* identifies research questions for which historically specific production relations, class positions, commodity mediation, surplus appropriation, accumulation, reproduction, and structural transformation are causally central, together with the empirical conditions under which those categories illuminate the case.

The domain is especially strong when an inquiry concerns wage labor, ownership or control of productive assets, accumulation, class-structured distribution, the reproduction of capitalist firms and households, recurrent pressures generated by competition, or historically changing relations between production and social reproduction. The framework can also illuminate contemporary digital and financial systems when the analyst specifies how newer assets, infrastructures, data, intellectual property, and contractual forms connect to production, appropriation, and accumulation.

GRE adds value where the inquiry requires distinctions that Marxian categories alone do not settle: heterogeneous value outside the value form, capability conversion, epistemic infrastructures, ecological and care relations with partially independent dynamics, artificial agency, multiple scales of relational power, and open future formation. The appropriate relation is therefore modular. Marxian mechanisms can become analytically important components within a broader GRE configuration where the research question requires additional domains.

Proposition 21.282 (Marxian–GRE extension condition). A *GRE extension of a Marxian explanation* is warranted when the mechanism under study depends materially on value forms, capabilities, relations, agents, ecological conditions, epistemic structures, or future-generation effects that cannot be represented adequately through the specified Marxian production, class, value, accumulation, and reproduction relations alone.

The condition also works in the opposite direction. GRE should import Marxian categories when capitalist production relations, surplus appropriation, accumulation, or class reproduction are genuinely causal. A generic relational description of a workplace, platform, supply chain, or financial system can lose explanatory power if it omits the historically specific economic relations through which capital and labor are reproduced.

21.14.9 Limits of Translation

Translation between Marxian political economy and GRE encounters unusually strong semantic overlap together with equally important theoretical remainder. Both frameworks emphasize relations, history, reproduction, power-bearing structures, and endogenous transformation. Those common coordinates create many opportunities for dialogue. Their conceptual objects remain distinct enough that apparent similarity requires explicit translation rules.

The first boundary concerns *relation*. Marxian production relations are typed and historically specific economic relations embedded in modes of production. GRE uses relation as a broader analytical primitive across economic, legal, ecological, educational, epistemic, political, and other domains. Translating a Marxian production relation into a generic GRE relation therefore loses content unless ownership, labor, control, appropriation, and reproduction are preserved.

The second boundary concerns *value*. Marxian value belongs to a theory of commodity-producing labor and capitalist social mediation. GRE's heterogeneous-value framework includes forms of value that may lack a common scalar, market expression, or labor-time mediation. A mapping can examine interactions between Marxian value and other values, especially where accumulation converts economic command into institutional, ecological, epistemic, or political effects. Identity between the value concepts would erase the difference the dialogue is intended to preserve.

The third boundary concerns *exploitation* and *power*. Marxian exploitation has a specific relation to labor-power and surplus value. GRE power covers a larger class of realized asymmetries affecting action spaces, conversions, dependencies, and trajectories. Exploitation can therefore be modeled as one power-bearing relation within GRE without making every power relation an exploitation relation.

The fourth boundary concerns *capital*. In Marxian political economy, capital cannot be reduced to a stock of machines, money, knowledge, or productive capacity; it is reproduced through historically specific social relations and valorization processes (Marx 1867; Marx 1993). GRE's generative capacity is broader and can exist in households, public institutions, ecosystems, communities, scientific systems, or infrastructures that need not function as capital. The two concepts can interact without serving as synonyms.

The fifth boundary concerns *historical materiality*. GRE accepts the historical generation of categories and the causal importance of material conditions while suspending stronger ontological conclusions. Marxian traditions themselves disagree about determination, agency, structure, historical necessity, and the scope of material explanation. Translation should therefore identify which Marxian interpretation is being used before mapping it into GRE.

The sixth boundary concerns *crisis*. Marxian crisis analysis examines disruption in capitalist reproduction through historically specific economic mechanisms. GRE's criticality vocabulary addresses sensitivity, thresholds, regime change, and dynamical transformation under separately stated assumptions. Structural resemblance can motivate comparative models, while empirical equivalence requires evidence that the same mechanism and state variables are involved.

Definition 21.283 (Marxian translation-boundary profile). A *Marxian translation-boundary profile* records the Marxian categories that admit structural correspondence with GRE, the historical and causal assumptions required for the mapping, the semantic remainder preserved by the original category, and the domains in which the GRE concept has wider or different scope.

These boundaries support layered explanation while preserving theoretical differentiation. A Marxian model can explain how surplus appropriation and accumula-

tion transform a production system. Institutional analysis can specify legal and organizational conditions. Feminist and social-reproduction analysis can examine household and care relations that reproduce labor-power. Ecological analysis can trace material throughput and biophysical limits. GRE can represent how these mechanisms interact, convert across domains, and alter future capability while preserving the distinct evidential and theoretical status of each layer.

Proposition 21.284 (Marxian translation-restraint condition). *A translation between Marxian political economy and GRE should remain partial whenever correspondence requires changing the historical meaning or causal role of production relation, class, value, exploitation, capital, accumulation, crisis, or materiality; the residual difference should remain visible as theoretical information.*

Marxian political economy therefore contributes a demanding relational challenge to GRE. It demonstrates how production, class, value forms, surplus appropriation, accumulation, crisis, and history can be analyzed as an interconnected process whose categories are themselves historically constituted. GRE can extend the field toward heterogeneous value, multiple domains of capability, ecological and epistemic infrastructures, artificial agency, and open future formation. The dialogue remains strongest when each framework retains the concepts it needs to identify mechanisms that the other would otherwise obscure. Section 21.15 turns next to Keynesian and Post-Keynesian economics, where effective demand, uncertainty, money, expectations, institutions, historical time, and financial instability reorganize the comparative architecture around macroeconomic coordination and open-ended temporal processes.

21.15 Keynesian and Post-Keynesian Economics

This section continues the theory-specific dialogue by reconstructing Keynesian and Post-Keynesian economics through effective demand, uncertainty, money, expectations, institutions, historical time, and financial instability. Its role is to examine an analytical tradition in which macroeconomic outcomes emerge through interdependent expenditure decisions, monetary and financial arrangements, prospective judgments, and historically situated institutional structures. The objective is interpretive and comparative. The discussion begins with Keynes's analysis of aggregate demand, money, investment, and uncertainty, then draws selectively on Kalecki, Robinson, Davidson, Chick, and Minsky to identify extensions that became important within heterogeneous Post-Keynesian traditions. The section proceeds from effective demand and uncertainty to money, expectations, institutions, historical time, and financial instability, and concludes with a GRE relational reconstruction and explicit translation boundaries. Table 21.15 summarizes the principal dialogue coordinates.

Definition 21.285 (Keynesian–Post-Keynesian macroeconomic configuration). *A Keynesian–Post-Keynesian macroeconomic configuration is a historically situated representation in which aggregate output and employment depend on effective demand, investment is conditioned by expectations and uncertainty, money and finance affect real economic activity, institutions shape adjustment and policy capacity, and sequential decisions can generate persistence, instability, and path-dependent trans-*

formation.

The definition names a family of approaches rather than a single unified doctrine. Keynes's *General Theory* reorganizes the analysis of employment around aggregate expenditure, investment, interest, money, and expectations (John Maynard Keynes 1936). His 1937 restatement emphasizes uncertainty and investment fluctuation while clarifying the relation between aggregate demand and output (J. M. Keynes 1937). Later Post-Keynesian work develops these themes in different directions: Kalecki connects effective demand to distribution and political conditions of full employment; Robinson extends analysis toward accumulation and longer-run development; Davidson emphasizes monetary production, uncertainty, and historical analysis; Chick reconstructs Keynes within changing monetary and institutional regimes; and Minsky develops a financial theory of investment and endogenous instability (Kalecki 1943; Robinson 1956; Davidson 1978; Chick 1983; Minsky 1986; Minsky 1992). The internal differences remain analytically relevant throughout the dialogue.

Proposition 21.286 (Keynesian reconstruction condition). *A relational reconstruction of Keynesian and Post-Keynesian economics should preserve the macroeconomic interdependence of expenditure and income, the constitutive role of monetary and financial arrangements, the prospective character of investment, the institutional conditions of adjustment, and the historical sequencing through which present decisions alter subsequent possibilities.*

21.15.1 Effective Demand

Effective demand supplies the first organizing coordinate because it changes the explanatory direction of macroeconomic analysis. In Keynes's framework, aggregate output and employment depend on the level of expenditure that firms expect to be profitable, with investment and consumption jointly shaping realized income and employment (John Maynard Keynes 1936). The 1937 restatement presents demand and supply for output as a whole together with uncertainty and investment fluctuation, reinforcing the macroeconomic level at which the argument operates (J. M. Keynes 1937). The analytical object is consequently an interdependent expenditure–income process rather than a collection of independently determined market quantities.

The relational significance of effective demand appears through circular dependence. One agent's expenditure becomes another agent's receipt; current sales affect production decisions; employment affects household income; income affects consumption; investment creates both present expenditure and future productive commitments. Macroeconomic coordination therefore depends on relations among sectors and balance positions whose local decisions can aggregate into outcomes that none of the participants individually selects.

Definition 21.287 (Effective-demand relation). *An effective-demand relation is a macroeconomic dependence in which planned and realized expenditures condition current production, income, employment, and the revenues through which subsequent expenditure plans are revised.*

The definition distinguishes effective demand from a static preference for consumption. It also separates the concept from a simple statement that “spending mat-

Table 21.15: Relational coordinates for Keynesian and Post-Keynesian economics

Coordinate	Keynesian–Post-Keynesian analytical object	Dialogue boundary
Effective demand	Aggregate expenditure, income formation, output, and employment through interdependent spending decisions	Reduction to a generic network multiplier or demand-side preference effect
Uncertainty	Limited prospective knowledge affecting investment, liquidity preference, and commitment	Identification with measurable risk or generic ignorance
Money	Institutionally organized monetary claims, liquidity, settlement, finance, and contractual denomination	Treatment as a neutral token or generic symbolic relation
Expectations	Prospective judgments coordinating present commitments to uncertain future returns	Reduction to statistically correct forecasts or isolated beliefs
Institutions	Monetary, financial, fiscal, labor, legal, and political arrangements conditioning macroeconomic adjustment	Translation into undifferentiated relational context
Historical time	Sequential, partially irreversible economic processes in which decisions alter later conditions	Identification with chronological dating alone or with GRE open futures in general
Financial instability	Endogenous changes in financing positions, leverage, cash-flow commitments, and asset valuations	Identification with generic volatility, crisis, or criticality
Relational reconstruction	Coupled expenditure, monetary, expectation, institutional, and temporal relations	Absorption of macroeconomic mechanisms into generic relation language
Translation limit	Semantic, causal, and historical remainder between Keynesian–Post-Keynesian categories and GRE	Theoretical identity inferred from relational resemblance

ters.” What matters analytically is the feedback architecture linking expenditure commitments, incomes, production, employment, and prospective profitability. The same expenditure can have different macroeconomic consequences under different import structures, capacity conditions, financial arrangements, tax systems, distributional patterns, and expectations.

Kalecki extends this perspective by treating public expenditure as capable of supporting full employment while also examining political resistance to sustained full-employment policy (Kalecki 1943). This extension is important for GRE because it shows that a technically feasible demand-management intervention may enter a power-bearing institutional configuration. Macroeconomic capacity and political willingness can therefore diverge.

Proposition 21.288 (Demand-interdependence condition). *Effective-demand analysis*

is most informative when expenditure decisions are represented as mutually conditioning sectoral commitments whose realized consequences feed back into income, employment, financing capacity, and later expenditure plans.

GRE can use this insight when tracing how resource flows generate relational consequences beyond the immediate transaction. A fiscal expenditure, investment programme, or credit expansion changes more than current allocation. It can alter employment relations, income security, firm survival, household capabilities, tax capacity, bargaining positions, debt commitments, expectations, and future investment possibilities. The Keynesian contribution gives this generative chain a disciplined macroeconomic starting point.

The translation requires restraint. Effective demand refers to a macroeconomic mechanism with specific accounting, behavioral, monetary, and institutional content. A generic GRE relation among spending nodes would be too weak if it failed to preserve income formation, sectoral positions, investment response, and the monetary settlement structure through which expenditure becomes effective.

21.15.2 Uncertainty

Uncertainty provides the second coordinate because investment and portfolio decisions concern futures that are only partially knowable at the time commitments are made. Keynes's 1937 discussion places uncertainty directly inside the explanation of investment fluctuation (J. M. Keynes 1937). Davidson later develops a Post-Keynesian interpretation in which uncertainty and historical analysis are central to monetary production rather than removable imperfections around an otherwise complete probabilistic model (Davidson 1978).

The relevant distinction is between prospective conditions that can be represented through sufficiently stable probability distributions and conditions in which the structure generating future outcomes is itself uncertain, changing, or only partially specified. In the latter case, economic agents rely on conventions, institutional routines, balance-sheet safeguards, liquidity, narratives, contractual devices, and provisional judgments to make commitments.

Definition 21.289 (Prospective uncertainty structure). A *prospective uncertainty structure* is the set of informational limits, model limits, institutional supports, conventions, and protective arrangements through which economic subjects make present commitments whose relevant future consequences cannot be represented with sufficient confidence by a stable probabilistic description.

This definition avoids turning uncertainty into a metaphysical property of the future. The analytical question is more local: what can the relevant subjects know, what representations are available, what contingencies are institutionally managed, and which future conditions remain outside credible calculation? The same environment can therefore contain calculable risks for one decision and deeper uncertainty for another.

Uncertainty has immediate relational consequences. A firm postponing investment affects suppliers and employment; a bank tightening credit changes borrowers' action spaces; households increasing liquid balances reduce current expenditure;

public guarantees can alter financing terms; and a shared convention can coordinate many participants until the convention loses credibility. Uncertainty is therefore mediated through relations among expectations, contracts, liquidity positions, institutional credibility, and collective behavior.

Proposition 21.290 (Uncertainty-mediated commitment condition). *Where relevant future conditions resist sufficiently stable probabilistic representation, economic commitment depends materially on institutional supports, conventions, liquidity arrangements, and revisable judgments that connect present action to uncertain future states.*

GRE can extend this analysis by tracing heterogeneous consequences of uncertainty management. Liquidity protection for one organization may transfer risk to another; contractual flexibility may preserve one actor's option set while narrowing another's; public backstops may stabilize aggregate capability while generating distributional or political effects. The object of inquiry becomes the relational distribution of uncertainty-bearing, uncertainty-transfer, and uncertainty-insulation capacities.

A translation boundary remains. GRE uses uncertainty in many domains, including legal, ecological, technological, educational, and political processes. Keynesian uncertainty belongs to a more specific macroeconomic architecture involving investment, money, liquidity, and expectations. The broader GRE concept should therefore retain the Keynesian mechanism where it is used rather than treating the two vocabularies as interchangeable.

21.15.3 Money

Money occupies a constitutive position in Keynesian and Post-Keynesian analysis because production and investment take place through monetary contracts, financing relations, balance sheets, and liquidity choices. In the *General Theory*, interest, liquidity preference, investment, and employment are analytically connected (John Maynard Keynes 1936). Davidson's reconstruction further treats money as embedded in a real-world monetary production system whose pricing and production processes cannot be cleanly separated from uncertainty and contractual organization (Davidson 1978).

A relational treatment begins by distinguishing several monetary functions that may coexist: unit of account, means of payment, settlement medium, store of value, contractual denomination, liquidity reserve, and component of financial portfolios. These functions depend on institutional arrangements and counterparties. A bank deposit, public currency, private debt instrument, or collateralized claim carries different rights, risks, settlement properties, and access conditions even when each is denominated in the same unit.

Definition 21.291 (Monetary-relation architecture). *A monetary-relation architecture is the institutional configuration of denominated claims, payment and settlement rules, liquidity positions, financing channels, contractual obligations, and credibility relations through which monetary commitments coordinate present production with future payment.*

The definition makes money analytically relational without reducing it to an abstract relation. Monetary claims have issuers, holders, settlement rules, legal sta-

tuses, maturity structures, and institutional supports. Their economic effects depend on these typed properties. A liquid asset is liquid relative to a market, institutional promise, settlement convention, or public authority capable of sustaining conversion under relevant conditions.

Chick's reconstruction is useful here because it emphasizes that Keynesian monetary analysis should be interpreted in relation to the institutional regime in which it operates (Chick 1983). Banking systems, central-bank practices, payment arrangements, capital markets, and fiscal institutions change over time. A monetary mechanism therefore may preserve its conceptual role while changing its concrete institutional realization.

Proposition 21.292 (Monetary non-neutrality condition). *Money becomes analytically non-neutral when monetary positions, liquidity preferences, financing conditions, or settlement institutions affect feasible production, investment, employment, or portfolio trajectories over the period relevant to the research question.*

This proposition does not require that monetary factors dominate every economic process. It identifies the conditions under which monetary relations enter the causal architecture. GRE can then examine how monetary access converts into productive capability, organizational survival, bargaining power, geographic mobility, political influence, or future option preservation.

The translation also clarifies a boundary with GRE's broader treatment of symbols and relational beings. Currency and financial claims may be relationally real because stable institutional arrangements give them causal efficacy. Their monetary character, however, depends on economic functions and institutional rules that generic symbolic efficacy does not capture. A GRE analysis of money should therefore retain denomination, liquidity, settlement, finance, and contractual enforceability as typed relations.

21.15.4 Expectations

Expectations connect uncertain futures to present macroeconomic commitments. Firms invest according to prospective revenues and financing conditions; households consume and save partly in relation to expected income and security; financial institutions price and ration credit through assessments of future repayment and collateral; asset holders form views about yields, liquidity, and capital values. Keynes's treatment of investment and the 1937 restatement place these prospective judgments close to the center of macroeconomic fluctuation (John Maynard Keynes 1936; J. M. Keynes 1937).

Expectations are relational because their consequences depend on interaction and mutual observation. An expectation about future demand partly concerns the expected decisions of other agents. A bank's lending outlook depends on borrower prospects and collateral markets. Firms observe competitors, policy signals, wage settlements, and financial conditions. Market participants can coordinate around conventions whose persistence changes the environment that initially made them plausible.

Definition 21.293 (Expectation-mediated commitment). *An expectation-mediated*

commitment is a present allocation, contract, investment, financing, or employment decision whose feasible and preferred form depends materially on a revisable representation of future economic conditions.

The definition keeps expectations tied to action. Beliefs that do not affect commitments may remain epistemically interesting while playing a limited economic role. Conversely, weakly held expectations can become consequential when large investments, debt contracts, or employment decisions depend on them.

Post-Keynesian analysis often gives special importance to conventions and historically formed interpretive practices because uncertainty limits the possibility of continuously deriving expectations from a stable statistical model. Chick's contextual reading of Keynes and Davidson's historical approach support analysis of expectations as institutionally situated rather than purely individual forecasts (Davidson 1978; Chick 1983). This makes the social organization of confidence an economic object.

Proposition 21.294 (Expectation-feedback condition). *Expectation-mediated commitments can alter the conditions against which later expectations are formed, creating feedback between prospective judgment, current action, realized income and prices, institutional response, and subsequent revision.*

GRE can deepen this feedback analysis by examining who has the capacity to shape shared expectations and whose expectations carry greater allocative consequence. Central banks, governments, major financial institutions, large firms, rating organizations, platforms, and media infrastructures can affect expectation formation through asymmetric informational, symbolic, or institutional positions. Expectations can therefore become interfaces between epistemic structure and economic power.

A translation limit remains between expectation and manifestation. GRE distinguishes relational realities from their context-dependent manifestations. Expectations are prospective representations held or enacted by subjects; they are not direct observations of future relational reality. Their economic significance arises because those representations guide commitments that can help generate the future configuration they anticipate, frustrate it, or produce an unintended alternative.

21.15.5 Institutions

Institutions enter Keynesian and Post-Keynesian economics through the concrete arrangements that organize money, finance, wage formation, fiscal capacity, investment, and policy response. The analytical tradition is therefore difficult to reconstruct through behavioral functions alone. Chick explicitly emphasizes the relevance of institutional context to the interpretation of Keynesian macroeconomics (Chick 1983). Kalecki's full-employment analysis adds a political-institutional dimension by examining how business interests can respond to policies capable of sustaining demand and employment (Kalecki 1943).

Relevant institutions include central banks, commercial banking systems, fiscal authorities, labor-market organizations, collective bargaining arrangements, social insurance, accounting conventions, payment systems, bankruptcy law, financial regulation, corporate governance, and international monetary arrangements. Their effects

are not uniform. Institutional combinations can influence how quickly expenditure changes affect employment, how financial losses are distributed, how credible public commitments appear, and which actors possess outside options during adjustment.

Definition 21.295 (Macroeconomic institutional configuration). *A macroeconomic institutional configuration is the historically situated set of monetary, financial, fiscal, labor, legal, and political arrangements that condition how expenditure, financing, expectations, prices, wages, employment, and policy responses interact.*

The definition supports comparison across regimes. Similar nominal policy instruments can operate differently when banking structures, labor institutions, exchange-rate arrangements, debt compositions, welfare systems, or political coalitions differ. Institutional context therefore changes both causal transmission and the distribution of adjustment burdens.

Minsky's analysis makes the institutional point especially visible in finance. Financial structures develop through relations among borrowers, lenders, asset markets, public authorities, and regulatory arrangements; the resulting system can become more fragile during periods that appear stable (Minsky 1986; Minsky 1992). Institutions can dampen such dynamics, redirect them, or create new forms of risk-taking through adaptation to existing safeguards.

Proposition 21.296 (Institution-conditioned macroeconomic mechanism). *A Keynesian or Post-Keynesian mechanism should be interpreted relative to the institutional configuration that governs financing, settlement, wage formation, policy capacity, and the distribution of risk during the period under study.*

This proposition fits GRE's emphasis on historically generated relational structures. Institutions can stabilize expectations, create reliable conversion pathways, distribute uncertainty, and preserve capabilities. They can also lock in dependence, privilege selected claims, transfer adjustment costs, or restrict alternative trajectories. GRE can therefore represent institutional macroeconomics through the joint analysis of coordination, power, value conversion, and future generativity.

Institutional translation requires specificity. Calling a central bank, wage-setting regime, or banking network a "relational structure" adds little unless the rights, authorities, liabilities, decision rules, and causal pathways are retained. GRE's broader relational vocabulary becomes useful only when it preserves the institutional mechanism identified by Keynesian or Post-Keynesian analysis.

21.15.6 Historical Time

Historical time provides the temporal coordinate through which Keynesian and Post-Keynesian analysis departs most sharply from descriptions that can be resolved through comparative statics alone. Investment commits resources before future returns are known; debts created today generate future payment obligations; capital equipment survives into later periods; institutions adapt; expectations are revised after realized outcomes; and macroeconomic trajectories inherit consequences of earlier decisions. Robinson's work on accumulation and Davidson's historical approach both place sequential development at the center of economic analysis (Robinson 1956; Davidson 1978).

Historical time is more than the inclusion of a time index. Sequence matters because changing the order of events can change the resulting configuration. A banking loss before a policy guarantee can produce a different path from the same loss after a credible guarantee. Investment before a collapse in demand creates different obligations from investment after demand conditions are known. Wage contracts, debt maturities, construction lags, training, and institutional reform each introduce temporal structures that cannot be compressed into a timeless equilibrium relation without analytical loss.

Definition 21.297 (Historically sequential macroeconomic process). *A historically sequential macroeconomic process is an economic evolution in which earlier commitments, realized events, and institutional responses modify the feasible states, information, balance positions, and decision conditions available at later stages.*

This definition is compatible with formal dynamic modeling, yet it does not presume that a single formalism captures the relevant history. Some questions may be addressed through stock–flow consistent models, simulations, event histories, archival reconstruction, or comparative institutional analysis. The methodological choice should follow the temporal mechanism under investigation.

Chick’s emphasis on interpreting Keynes within historically changing monetary institutions reinforces this point (Chick 1983). A theory formulated within one monetary and financial regime may require modification when banking technology, policy instruments, payment structures, or market organization change. Historical context therefore affects both the economy and the adequacy of the model used to represent it.

Proposition 21.298 (Historical-state dependence). *Where earlier economic commitments materially alter later balance sheets, institutions, capabilities, expectations, or feasible actions, explanation should preserve the sequence through which those conditions were generated.*

GRE shares this interest in history-bearing configurations. Its generative space-time vocabulary can represent how economic events modify future relational possibilities across multiple timescales. Keynesian and Post-Keynesian analysis supplies sharper macroeconomic mechanisms for this broader architecture: investment lags, debt commitments, expectation revisions, institutional persistence, cumulative income effects, and financial restructuring.

The conceptual overlap remains partial. GRE’s open-future language addresses a broader class of relationally generated possibilities, including ecological, educational, legal, technological, and political futures. Historical time in Post-Keynesian economics concerns specific economic processes and the methodological consequences of sequential, irreversible, or path-dependent development. Translation is strongest when the macroeconomic mechanism remains explicit.

21.15.7 Financial Instability

Financial instability provides the clearest Post-Keynesian extension from uncertainty and money into endogenous system dynamics. Minsky’s financial-instability hypothesis analyzes capitalist economies with capital assets, sophisticated finance, and debt

commitments whose composition can change during periods of prosperity (Minsky 1992). His distinction among hedge, speculative, and Ponzi finance describes different relations between expected cash flows and contractual payment commitments, while *Stabilizing an Unstable Economy* develops the broader connection among investment, finance, asset prices, and cyclical instability (Minsky 1986).

The relational object is the balance-sheet linkage among borrowers, lenders, asset markets, and payment commitments. A debt position that is manageable under one income and refinancing environment may become fragile when interest rates, asset values, cash flows, or refinancing access change. Stability itself can alter behavior by encouraging greater leverage, shorter refinancing horizons, or stronger confidence in continued asset appreciation.

Definition 21.299 (Financial-fragility configuration). *A financial-fragility configuration is a network of financing positions in which the capacity of economic units to meet contractual payment commitments depends increasingly on continued cash-flow performance, refinancing access, asset-price validation, or supportive institutional conditions.*

The definition emphasizes dependence structure rather than a single leverage ratio. Two firms with the same debt-to-asset ratio can occupy different fragility positions if their maturities, cash-flow volatility, collateral quality, refinancing channels, currency denomination, or counterparties differ. Aggregate fragility likewise depends on correlated positions and institutional response capacity.

Proposition 21.300 (Endogenous fragility condition). *A financial system exhibits endogenous fragility when behavior generated during relatively stable conditions changes financing structures in ways that increase dependence on favorable refinancing, asset valuations, or cash-flow continuation and thereby amplify the consequences of later disturbance.*

This proposition creates a productive dialogue with GRE's work on criticality and multiscale dynamics. Both can study how apparently stable configurations accumulate sensitivity. The concepts remain distinct. Minsky's mechanism is financial and balance-sheet specific; GRE criticality is a broader dynamical vocabulary whose application requires separately defined state variables, transition mechanisms, evidence, and thresholds.

GRE can extend financial-instability analysis by tracing value conversion and power across the stabilization process. Bailouts, liquidity facilities, bankruptcy rules, collateral revaluation, debt restructuring, and fiscal support redistribute losses, claims, control rights, and future capabilities. Stabilization can preserve a system while changing who bears adjustment costs and who acquires future decision power.

The Minskyan contribution is therefore especially important for a generative relational economics of intervention. Policy enters a moving financial configuration in which prior stability, institutional design, and participant adaptation have already generated the conditions of current fragility. Intervention changes the subsequent adaptive environment and can reshape future financing behavior as well as present solvency.

21.15.8 Relational Reconstruction

A GRE reconstruction of Keynesian and Post-Keynesian economics begins with macroeconomic interdependence rather than isolated subject choice. Effective demand links expenditures, incomes, employment, and production; uncertainty links prospective knowledge to commitment; money links claims and settlement to production and finance; expectations connect future representations to present action; institutions condition transmission and adjustment; historical time makes sequence consequential; and financial structures can transform stability into fragility. These coordinates form a relational macroeconomic architecture with unusually direct affinity to GRE.

Definition 21.301 (Keynesian–GRE translation profile). A *Keynesian–GRE translation profile* records the macroeconomic relations among expenditure, money, expectations, institutions, time, and finance, together with the GRE objects required to represent their effects on capabilities, power, value conversion, relational reproduction, and future possibility.

The first translation concerns *effective demand and generativity*. Demand management can preserve employment, organizational continuity, household income, and productive capacity, thereby affecting later generative possibilities. Yet generativity is broader than aggregate expenditure. An increase in demand can support capability formation, resource depletion, speculative asset appreciation, care provision, military production, ecological restoration, or several of these at once. GRE therefore adds differentiated value and future-formation questions after the effective-demand mechanism has been identified.

The second translation concerns *uncertainty and capability*. Liquidity, insurance, public guarantees, diversified income sources, savings, social protection, and access to credit can preserve action capacity under uncertainty. Their distribution is uneven. A system may therefore stabilize aggregate expenditure while leaving some households, firms, regions, or institutions with substantially narrower future option sets.

The third translation concerns *money and conversion interfaces*. Monetary access enables conversion among labor, goods, services, assets, claims, and future commitments. Control over payment infrastructure, credit creation, collateral recognition, or refinancing can become a source of relational power. GRE can examine these conversion interfaces while retaining the monetary specificity supplied by Keynesian analysis.

The fourth translation concerns *expectations and epistemic structure*. Expectations depend on information, models, conventions, narratives, institutional credibility, and authority. Their formation is therefore connected to the epistemic economy developed earlier in this book. Some actors possess greater capacity to produce forecasts, set policy signals, define accounting categories, or stabilize conventions. Macroeconomic expectation formation can consequently become a site of asymmetric generative capacity.

The fifth translation concerns *historical time and relational reproduction*. Investment creates assets and obligations that persist; employment histories shape skills and attachment; recessions can damage organizations and public finances; financial

crises restructure ownership and regulation; policy responses can create institutional memory. GRE can model these as history-bearing configurations in which current intervention changes the structure from which subsequent decisions proceed.

Proposition 21.302 (Macroeconomic generativity condition). *A GRE extension of Keynesian or Post-Keynesian analysis becomes warranted when a macroeconomic mechanism materially changes the distribution, durability, convertibility, or future-generating capacity of relations and resources beyond the aggregate variables required to identify that mechanism.*

The proposition defines complementarity rather than theoretical succession. Keynesian analysis can be more precise than GRE when the research question concerns aggregate-demand shortfalls, liquidity preference, investment behavior, fiscal transmission, or financial fragility. GRE becomes useful when the same mechanism produces cross-domain effects involving capability, power, heterogeneous value, ecological conditions, knowledge infrastructure, or longer-run relational reproduction.

Proposition 21.303 (Keynesian domain-of-adequacy condition). *Keynesian and Post-Keynesian approaches have a particularly strong domain of adequacy where monetary production, aggregate expenditure, investment, uncertainty, financing structures, and historically situated institutions jointly condition output, employment, and macroeconomic stability.*

This domain should remain visible in multi-theoretical work. A relational vocabulary that merely redescribes effective demand or financial instability in more general terms would reduce explanatory resolution. The GRE contribution lies in connecting these well-specified macroeconomic mechanisms to additional relational domains while preserving their original causal content.

21.15.9 Limits of Translation

Translation between Keynesian–Post-Keynesian economics and GRE is unusually productive because both emphasize interdependence, historical development, uncertainty, institutions, and the causal significance of relations. The same overlap creates a risk of premature equivalence. The translation therefore requires explicit boundaries around the concepts that carry theory-specific meaning.

The first boundary concerns *effective demand*. Effective demand is a macroeconomic relation among expenditure, production, income, and employment. GRE generativity concerns the production or transformation of future capacities, relations, and possibilities across heterogeneous domains. Demand can affect generativity, while the concepts answer different questions. A demand expansion may raise employment even when its ecological or distributive generative consequences are contested.

The second boundary concerns *uncertainty*. Keynesian uncertainty is especially consequential for investment, liquidity, and expectations in a monetary economy. GRE addresses uncertainty in a wider range of relational processes. Translation should preserve the monetary and prospective decision mechanism rather than treating uncertainty as a generic synonym for incomplete knowledge.

The third boundary concerns *money*. Keynesian and Post-Keynesian money is

embedded in denomination, payment, finance, liquidity, and contractual structures. GRE's category of relational reality is broader. Currency can be represented as a relationally efficacious institution, while its economic role requires the more specific monetary architecture.

The fourth boundary concerns *expectations*. Expectations are representations of future economic conditions that guide present commitments. GRE manifestation refers more generally to context-dependent presentation and epistemic access. The two can interact, especially where observable manifestations shape expectations, yet one does not reduce to the other.

The fifth boundary concerns *institutions*. Keynesian institutions are often analyzed through their macroeconomic functions in monetary, financial, fiscal, and labor processes. GRE studies institutions across a wider set of domains and asks how they generate or constrain relations and capabilities. A translation gains value when the macroeconomic function remains typed inside the broader relational architecture.

The sixth boundary concerns *historical time*. Post-Keynesian historical time emphasizes sequence, commitment, irreversibility, and the dependence of later conditions on earlier economic events. GRE generative spacetime can incorporate these features while also representing cross-domain histories and open future formation. Structural correspondence therefore remains partial.

The seventh boundary concerns *financial instability and criticality*. Minsky's financial-instability hypothesis specifies balance-sheet mechanisms through which financing patterns can become more fragile during prosperity (Minsky 1992). GRE criticality refers to a broader family of dynamical situations involving sensitivity, thresholds, and possible regime change. A financial system can be studied with both vocabularies only after the variables, mechanisms, and empirical correspondences are specified.

Definition 21.304 (Keynesian translation-boundary profile). *A Keynesian translation-boundary profile records the Keynesian or Post-Keynesian mechanism being translated, the institutional and temporal assumptions supporting it, the GRE coordinate to which it is related, and the causal or semantic remainder that should remain attached to the original concept.*

These boundaries support layered explanation. A Keynesian model can identify an expenditure shortfall; a Minskyan analysis can identify fragility in financing positions; institutional analysis can specify policy and regulatory structures; distributional analysis can trace incidence; ecological analysis can examine material consequences; and GRE can study how these mechanisms jointly transform heterogeneous value, relational power, capabilities, and future option structures. The layers can communicate without collapsing into one vocabulary.

Proposition 21.305 (Keynesian translation-restraint condition). *A translation between Keynesian–Post-Keynesian economics and GRE should remain partial whenever relational correspondence would erase the macroeconomic role of effective demand, monetary institutions, prospective uncertainty, expectations, sequential history, or balance-sheet finance.*

Keynesian and Post-Keynesian economics therefore contribute a macroeconomic relational architecture in which expenditure, money, expectations, institutions, his-

torical sequence, and finance jointly shape production and employment. GRE can extend this architecture toward heterogeneous value, cross-domain conversion, relational power, capability formation, and open future generation while preserving the mechanisms that give Keynesian analysis its explanatory precision. Section 21.16 turns next to institutional and historical economics, where rules, habits, transaction structures, path dependence, and institutional change become the primary comparative coordinates.

21.16 Institutional and Historical Economics

This section extends the theory-specific dialogue to institutional and historical economics. Its role is to examine economic approaches in which rules, habits, organizations, governance arrangements, inherited trajectories, and historically specific forms of economic coordination enter the explanation directly. The objective is interpretive and comparative. The discussion treats institutional economics as a heterogeneous family comprising American institutionalism associated with Veblen and Commons, historically oriented accounts such as Polanyi's instituted economy, and new institutional economics associated with Coase, North, and Williamson; these approaches share an interest in institutions while differing substantially in their assumptions, causal mechanisms, and normative commitments (Rutherford 1994). The section proceeds through institutions, rules, habits, path dependence, transaction costs, institutional change, and historical specificity, then develops a GRE relational reconstruction and identifies limits of translation. Table 21.16 summarizes the principal dialogue coordinates.

Definition 21.306 (Institutional–historical configuration). *An institutional–historical economic configuration is a historically situated arrangement in which recurrent rules, habits, organizations, governance forms, enforcement practices, inherited technologies, and collective expectations condition economic action and are themselves reproduced or transformed through that action.*

This definition is deliberately broader than any one institutionalist vocabulary. Veblen's evolutionary programme emphasizes cumulative causation and historically formed conduct; Commons places collective action, transactions, and working rules near the center of institutional economics; North defines institutions as humanly devised constraints structuring interaction; Coase and Williamson analyze governance and the costs of organizing transactions; and Polanyi treats economic processes as instituted within historically variable social arrangements (Veblen 1898; Commons 1931; North 1990; Coase 1937; Williamson 2000; Polanyi 1957). These formulations overlap while retaining distinct analytical meanings.

Proposition 21.307 (Institutional reconstruction condition). *A relational reconstruction of institutional and historical economics should preserve the specific mechanisms through which rules, habits, governance arrangements, and inherited historical sequences condition action, while also preserving the capacity of actors and collective processes to reproduce, reinterpret, contest, and transform those arrangements.*

Table 21.16: Relational coordinates for institutional and historical economics

Coordinate	Institutional–historical analytical object	Dialogue boundary
Institutions	Durable rules, organizations, norms, governance arrangements, and patterned expectations structuring interaction	Reduction of heterogeneous institutions to generic constraints or context
Rules	Formal and informal prescriptions, permissions, procedures, and working rules governing recurrent action	Treatment of rules as self-executing statements detached from interpretation and enforcement
Habits	Acquired dispositions and recurrent modes of conduct participating in institutional reproduction	Identification of habit with mechanical repetition or fixed preference
Path dependence	Mechanism-specific dependence of later feasible trajectories on earlier sequences and investments	Use of historical sequence alone as sufficient evidence of path dependence
Transaction costs	Costs and frictions associated with discovering, negotiating, monitoring, enforcing, and governing exchange or organization	Expansion of transaction cost into an unrestricted residual explanation
Institutional change	Evolution, reinterpretation, bargaining, conflict, design, learning, and adaptation within inherited arrangements	Treatment of change as either purely deliberate design or purely spontaneous evolution
Historical specificity	Dependence of economic categories and mechanisms on historically generated institutional configurations	Conversion of contextual validity into unrestricted relativism
Relational reconstruction	Coupled rule, habit, governance, power, resource, and history-bearing relations	Absorption of institutional mechanisms into generic relational vocabulary
Translation limit	Conceptual and causal remainder among institutional traditions and GRE	Identity inferred from shared attention to relations and history

21.16.1 Institutions

Institutions provide the first coordinate because institutional approaches assign explanatory weight to durable arrangements that organize recurrent economic interaction. The term nevertheless carries different meanings across traditions. Commons characterizes institutional economics through collective action and working rules governing transactions (Commons 1931). North describes institutions as humanly devised constraints that structure political, economic, and social interaction, while distinguishing institutions from organizations operating within those constraints (North 1990). Williamson separates the broader institutional environment from governance

arrangements through which transactions are organized (Williamson 2000). Polanyi uses a wider historical lens in which economic activity is instituted through patterned relations of reciprocity, redistribution, and exchange (Polanyi 1957). Rutherford's comparison of old and new institutionalism consequently cautions against treating institutional economics as a single theoretical programme (Rutherford 1994).

Definition 21.308 (Institutional relation). An *institutional relation* is a recurrently reproduced relation in which recognized rules, roles, expectations, enforcement practices, or organizational arrangements condition the admissible and intelligible conduct of participating subjects.

The definition emphasizes reproduction because an institution ordinarily persists through repeated enactment. A property regime, payment system, labor contract, corporate form, licensing rule, professional norm, or household convention affects conduct because participants anticipate that other actors, organizations, and authorities will respond in patterned ways. Institutional efficacy therefore depends on a configuration involving rule content, interpretation, recognition, material capacity, sanction, and expectation.

The relational view also clarifies why institutions can enable action while constraining it. Property rules restrict some forms of access while making other transfers more predictable. Corporate law can limit particular liabilities while enabling durable pooled organization. Accounting standards restrict representational discretion while enabling comparison and contractual coordination. Public standards can impose compliance burdens while creating compatibility among otherwise disconnected actors. The same institution can therefore alter multiple dimensions of capability simultaneously.

Proposition 21.309 (Institutional conditioning condition). *Institutional explanation is strongest when the relevant rule, role, organization, enforcement arrangement, and expectation structure can be identified together with the mechanism through which they alter feasible actions, anticipated responses, or the distribution of resources and authority.*

GRE can represent institutions as relatively stabilized relational configurations, but that translation should preserve institutional typing. A court, family norm, stock exchange, professional credential, payment protocol, and informal reciprocity practice may each stabilize expectations, yet their authority, enforcement, temporal durability, membership, and consequences differ. Relational abstraction becomes useful when it allows these differences to be compared without erasing them.

21.16.2 Rules

Rules supply a second coordinate because many institutional mechanisms operate through recurrent prescriptions, permissions, procedures, and expectations. Commons's concept of working rules is especially important: collective action structures what participants can, must, may, or may not do within transactions and organized relationships (Commons 1931). North likewise includes formal rules and informal constraints in the institutional structure that shapes interaction (North 1990). Hodgson's reconstruction of old institutional economics emphasizes rules together with habits as foundational to institutionally structured behavior (Hodgson 1998).

Definition 21.310 (Working-rule configuration). A *working-rule configuration* is a recurrent arrangement in which a rule acquires practical economic effect through interpretation, recognition, monitoring, enforcement, and expectations concerning the responses of relevant participants.

The practical effect of a rule therefore extends beyond its textual statement. Two jurisdictions can contain similarly worded legal provisions while differing in enforcement capacity, administrative interpretation, litigation cost, organizational compliance, and social recognition. A workplace may have a formal policy that is routinely displaced by an informal convention. A platform can alter effective rules through software architecture even when contractual terms remain unchanged. Institutional analysis consequently benefits from distinguishing rule formulation from rule enactment.

Rules also vary in the economic objects they constitute. Some rules regulate an already recognized activity; others help constitute the categories through which the activity becomes possible. Currency law, corporate incorporation, intellectual-property regimes, professional licensing, bankruptcy procedure, and accounting classifications can participate in defining economic objects and statuses as well as governing their use. The relational effect is therefore partly generative: rules can contribute to the production of subjects, claims, assets, liabilities, offices, and recognized transactions.

Proposition 21.311 (Rule-enactment condition). A rule should be treated as economically operative when its practical effects can be traced through the relations of interpretation, recognition, enforcement, and expectation that connect the rule to recurrent conduct.

This proposition creates a direct interface with GRE's analysis of manifestation and relational reality. A written rule is one manifestation of an institutional arrangement. Its relational reality depends on the network of practices through which it becomes consequential. The translation remains incomplete whenever the legal, organizational, cultural, or technological mechanisms of enactment are left unspecified.

21.16.3 Habits

Habits introduce the formation of economic subjects into institutional analysis. Veblen's evolutionary economics treats conduct as historically cumulative, with behavioral dispositions formed through changing institutional conditions (Veblen 1898). Hodgson develops this institutionalist lineage by emphasizing habits and rules and by treating actor and structure as recursively related rather than analytically reducible to one another (Hodgson 1998). This perspective gives institutional economics a distinctive account of persistence: institutions endure partly because they become embodied in recurrent dispositions, routines, expectations, and interpretive practices.

Definition 21.312 (Habit-mediated institutional reproduction). *Habit-mediated institutional reproduction* is a process in which repeated participation in an institutional configuration contributes to durable dispositions or recurrent modes of action that, when enacted, help reproduce or gradually modify that configuration.

Habit in this sense is richer than mechanical repetition. Economic actors learn

what counts as an appropriate contract, credible promise, reasonable price, normal career, legitimate authority, safe asset, or acceptable risk through repeated participation in institutional settings. These acquired dispositions reduce the need to reconstruct every decision from first principles. They also create inertia because changing a formal rule may leave embodied routines, expectations, professional practices, and organizational competencies in place.

The recursive structure is analytically important. Institutions influence the formation of habits; habitual conduct contributes to institutional persistence; changed conditions can make inherited habits maladaptive; revised practices can eventually alter institutional expectations. This sequence allows institutional analysis to study endogenous subject formation while preserving reflexivity, variation, and the capacity for innovation among subjects.

Proposition 21.313 (Reciprocal formation condition). *Institutional analysis gains explanatory depth when it identifies both the process through which an institution shapes recurrent dispositions and the process through which those dispositions contribute to the reproduction, reinterpretation, or transformation of the institution.*

GRE can extend this mechanism through generative capacity. Habit formation can enlarge capability by creating skill, trust, fluency, and coordination capacity; it can also narrow perceived possibility by stabilizing conventions that make alternative arrangements difficult to imagine or enact. The relevant evaluative question therefore concerns the generative consequences of a habit-bearing institutional configuration across different subjects and timescales.

21.16.4 Path Dependence

Path dependence provides a more specific account of how history can enter economic explanation. David's analysis of technological adoption emphasizes technical interrelatedness, scale economies, and quasi-irreversibility as mechanisms through which early sequences can influence later trajectories (David 1985). Arthur formalizes related processes in settings with increasing returns, where historical events can influence technology selection and lock-in (Arthur 1989). North incorporates path dependence into institutional change by emphasizing increasing returns, organizational adaptation, and inherited institutional matrices (North 1990). The common insight is mechanism-specific: earlier events matter because they modify the conditions under which later choices are made.

Definition 21.314 (Institutional path dependence). *Institutional path dependence is dependence of later feasible or comparatively attractive trajectories on earlier sequences through identifiable mechanisms such as increasing returns, learning, complementarity, sunk investment, coordination effects, or costly institutional conversion.*

The definition prevents path dependence from becoming a synonym for the general importance of history. Every economic configuration has a past, but path dependence requires a mechanism linking sequence to later option structure. An early infrastructure standard may attract complementary investment; a legal form may generate specialized professional expertise; a payment network may acquire users because other users are already present; a welfare institution may create administra-

tive capabilities and constituencies that affect later reform. In each case, the historical sequence changes the cost or feasibility of subsequent alternatives.

Path dependence also interacts with power. Early institutional advantages can create resources for defending an arrangement, while excluded groups can face increasing costs of entry or representation. These dynamics require separate analysis of power and become especially important where increasing returns attach to control over standards, infrastructure, legal recognition, data, or organizational capacity.

Proposition 21.315 (Path-mechanism condition). *A claim of institutional path dependence should identify the mechanism through which earlier events alter later opportunity, cost, coordination, or conversion structures, together with evidence that the mechanism persists over the relevant historical interval.*

GRE can represent such processes as history-bearing relational configurations. The added value lies in examining how the inherited path redistributes future generative capacity across subjects. Lock-in can preserve coordination benefits while constraining experimentation; institutional continuity can protect expectations while narrowing alternative trajectories. The evaluation therefore remains multidimensional.

21.16.5 Transaction Costs

Transaction-cost analysis shifts attention toward the comparative organization of economic coordination. Coase's account of the firm begins from the observation that use of the price mechanism carries costs associated with discovering prices, negotiating, and organizing exchange, thereby creating an analytical problem of why coordination occurs through firms as well as markets (Coase 1937). Williamson develops this line into new institutional economics, treating governance structures as alternative arrangements for organizing transactions and distinguishing governance from the broader institutional environment (Williamson 2000). The resulting programme provides a mechanism-specific language for comparing contractual and organizational forms.

Definition 21.316 (Transaction-governance interface). *A transaction-governance interface is the institutional arrangement through which parties discover counterparts, specify commitments, transfer claims or resources, monitor performance, resolve disputes, and adapt their relationship as conditions change.*

The definition keeps transaction costs tied to concrete governance tasks. Search, measurement, bargaining, monitoring, enforcement, adaptation, and dispute resolution can each generate costs, but their relative importance varies by transaction and institutional setting. An open market, long-term contract, platform, cooperative, public agency, household, or vertically integrated firm can organize similar resource flows through very different authority and information structures.

Transaction-cost reasoning is particularly useful when governance forms can be compared against a defined coordination problem. Its explanatory precision declines when every institutional difference is retrospectively described as cost-minimizing. Observed arrangements can also reflect bargaining power, political settlement, legal inheritance, ideology, distributive conflict, technological constraints, and historical accident. Institutional explanation therefore benefits from treating transaction cost

as one causal family among several.

Proposition 21.317 (Transaction-cost scope condition). *Transaction-cost analysis has a strong domain of adequacy when the research question concerns comparative governance of identifiable transactions and the relevant search, contracting, monitoring, enforcement, or adaptation costs can be specified independently of the observed organizational outcome.*

GRE can connect this analysis to conversion interfaces. A transaction frequently converts one recognized value or claim into another through legal, informational, monetary, and organizational infrastructure. Governance affects who can enter the interface, what information is visible, which risks are allocated, how disputes are resolved, and who bears adjustment costs. The relational extension therefore concerns the distribution and future consequences of governance as well as its coordination costs.

21.16.6 Institutional Change

Institutional change brings persistence and transformation into the same analytical frame. Veblen's evolutionary orientation treats institutions and conduct as cumulatively changing through historical processes (Veblen 1898). Commons emphasizes collective action and working rules, making bargaining, legal ordering, and organized adjustment central to institutional life (Commons 1931). North analyzes institutional change through interactions among formal rules, informal constraints, organizations, incentives, and path-dependent learning (North 1990). Rutherford's comparison further shows that institutional traditions differ over the relative importance of spontaneous evolution, deliberate design, and rule-following (Rutherford 1994).

Definition 21.318 (Institutional transformation). *An institutional transformation is a change in the rules, roles, governance arrangements, enforcement practices, habitual expectations, or organizational capacities through which recurrent economic relations are constituted and reproduced.*

Institutional change can proceed through multiple mechanisms. Legislatures may revise formal rules; courts may reinterpret existing rules; organizations may develop new routines; technologies may alter enforcement and coordination possibilities; crises may change coalitions; demographic or ecological pressures may make inherited arrangements less viable; informal practices may shift before law follows. These pathways can operate simultaneously and on different timescales.

This plurality matters because institutional persistence cannot be inferred from formal continuity. A nominally unchanged rule can acquire a different practical meaning as enforcement, technology, social expectation, or organizational capacity changes. Conversely, formal reform can have limited effect when complementary practices and capabilities remain unchanged. Institutional analysis therefore requires attention to the configuration surrounding the rule.

Proposition 21.319 (Institutional-change plurality). *An account of institutional change should distinguish the mechanisms of formal revision, interpretive change, organizational adaptation, habitual transformation, technological mediation, bargaining, and conflict when more than one contributes materially to the observed transition.*

GRE adds a future-oriented question: which transformations alter the capacity of a configuration to generate viable subsequent relations? An institutional reform can reduce current coordination cost while depleting ecological resilience, concentrate expertise while narrowing participation, or expand access while creating new dependencies. Institutional change is therefore evaluable through multiple generative consequences, including dimensions that extend beyond efficiency.

Proposition 21.320 (Institutional-generativity condition). *A GRE extension becomes analytically relevant when institutional change materially alters the distribution, durability, convertibility, or regenerative capacity of resources and relations beyond the institutional mechanism required to explain the immediate change itself.*

21.16.7 Historical Specificity

Historical specificity supplies the final substantive coordinate. Veblen's critique of taxonomic economics calls for an evolutionary account of cumulative economic life (Veblen 1898). Polanyi's historical analysis of market society emphasizes that the organization of land, labor, and money through market institutions arose through historically specific political and social transformations (Polanyi 1944). His concept of the economy as an instituted process further directs attention to historically variable patterns through which material provisioning is organized (Polanyi 1957). North similarly links institutional structures to long-run economic performance while treating institutional evolution as path dependent (North 1990).

Definition 21.321 (Historical institutional specificity). *Historical institutional specificity* is the dependence of an economic category, mechanism, or empirical regularity on institutional relations whose form, authority, and practical meaning are generated within a bounded historical configuration.

Historical specificity remains compatible with comparison across periods and requires the object of comparison to be specified carefully. A market, firm, wage relation, household, contract, currency, welfare institution, or property claim can persist as a named category while its internal relations change significantly. Comparative analysis should therefore establish which relational features are sufficiently stable for comparison and which features are historically transformed.

The same discipline applies to models. A formal representation may be highly informative within an institutional range for which its categories remain stable. When the institution generating those categories changes, parameter adjustment may be insufficient because the economic object itself has changed. Historical institutional analysis is therefore especially relevant to regime change, technological transition, state formation, financial transformation, and the reorganization of labor or property relations.

Proposition 21.322 (Historical-scope condition). *An economic concept or model should carry its institutional scope conditions explicitly when the identity, measurement, or causal role of its principal objects depends materially on historically specific rules and organizations.*

GRE shares this concern through its treatment of relational reality and manifestation. A category such as "worker," "owner," "asset," "firm," or "currency" can be

stable enough for analysis while remaining historically generated. Ontological restraint is therefore compatible with historically precise economic description: the aim is to identify the relational conditions under which a category becomes sufficiently durable and causally consequential for inquiry.

21.16.8 Relational Reconstruction

A GRE reconstruction of institutional and historical economics begins from the observation that institutions are already relational objects in a strong analytical sense. Rules connect participants to recognized permissions and obligations; habits connect past participation to present disposition; governance arrangements connect authority, information, monitoring, and adaptation; path dependence connects historical sequences to later opportunity structures; transaction costs arise at interfaces of coordination; and institutional change modifies the relations through which economic objects are reproduced. This affinity makes institutional economics one of the closest dialogue partners for GRE, while also increasing the risk of premature theoretical identification.

Definition 21.323 (Institutional–GRE translation profile). An *institutional–GRE translation profile* records the relations through which institutions structure conduct and historical trajectories, together with the additional GRE objects required to examine heterogeneous value, capability, power, epistemic access, conversion, and future generativity.

The first translation concerns *institutions and relational configurations*. An institution can be represented as a stabilized relation-bearing structure, but GRE should retain the institutional economist's distinctions among formal rules, informal constraints, organizations, governance forms, habits, and enforcement practices. Generic relational language becomes useful only after these local mechanisms are specified.

The second translation concerns *rules and constraints*. GRE treats constraints as fundamental analytical objects, yet institutional rules can simultaneously constrain, enable, constitute, and distribute authority. A bankruptcy rule, for example, restricts some claims while enabling reorganization; a professional credential excludes some entrants while creating a recognized competence interface. The generative effect therefore depends on which subjects, relations, and future actions are affected.

The third translation concerns *habits and subject formation*. Institutionalism supplies a mechanism by which economic subjects acquire durable dispositions through repeated participation. GRE can connect this to generative capacity by asking whether the resulting habits expand competence, trust, and coordination or reinforce dependency, exclusion, and narrowed possibility. These outcomes can coexist across different participants.

The fourth translation concerns *path dependence and generative spacetime*. Path-dependent institutions are history-bearing configurations whose current feasible transitions partly reflect prior investments, complementarities, and learning. GRE can add analysis of how these inherited structures distribute the capacity to create alternative paths. Some actors may possess resources to exit or redesign an institution while others remain strongly bound to it.

The fifth translation concerns *transaction governance and value conversion*. Governance arrangements organize interfaces through which resources, rights, information, and claims are converted. Transaction-cost economics can specify why one governance form coordinates a transaction more effectively under defined conditions. GRE can then examine who controls the interface, whose value dimensions are recognized, which costs are externalized, and what future dependencies are generated.

The sixth translation concerns *institutional change and power*. Institutions influence who can propose, veto, interpret, enforce, and benefit from change. Power therefore enters institutional dynamics through rule-making authority, organizational resources, agenda control, expertise, legal standing, and control over infrastructures. GRE's power framework can make these asymmetries explicit while relying on institutional analysis for the concrete mechanism.

Proposition 21.324 (Institutional relational complementarity). *GRE is most complementary to institutional economics when it begins from a specified institutional mechanism and extends the analysis toward heterogeneous value, capability, power, conversion, or future-generative consequences lying outside the explanatory task of the original mechanism.*

Proposition 21.325 (Institutional domain-of-adequacy condition). *Institutional and historical approaches have a particularly strong domain of adequacy where economic outcomes depend on durable rules, governance arrangements, recurrent practices, inherited trajectories, organizational capacities, or historically specific categories whose effects cannot be represented adequately as contemporaneous prices and preferences alone.*

This domain includes many problems central to GRE: institutional persistence, rule-mediated allocation, governance of conversion interfaces, capability formation, historical lock-in, and organizational adaptation. The analytical gain from dialogue comes from preserving the institutional mechanism while widening the field of consequences that can be traced.

21.16.9 Limits of Translation

The affinity between institutional economics and GRE creates several translation risks. The first concerns heterogeneity within institutional economics itself. Old American institutionalism, new institutional economics, transaction-cost economics, historical institutional analysis, and Polanyian institutionalism differ in their accounts of agency, rationality, power, efficiency, evolution, and historical change (Rutherford 1994). A single relational paraphrase can conceal these disagreements.

Definition 21.326 (Institutional translation remainder). *An institutional translation remainder is the portion of an institutional concept or mechanism whose explanatory content depends on historically specific rules, behavioral assumptions, governance mechanisms, or disciplinary commitments that remain irreducible to a more general GRE relational description.*

The second risk concerns the meaning of institution. GRE's concept of a stable relational configuration is broader than most institutional-economic definitions. Treating every stable relation as an institution would weaken the institutional concept and

obscure the special roles of rule recognition, authority, normativity, organization, and enforcement. Institutional status therefore requires additional criteria beyond relational persistence.

The third risk concerns transaction costs. A broad GRE account of conversion, coordination, or relational friction can include phenomena that transaction-cost economics does not classify in the same way. Transaction-cost explanation should retain its comparative-governance structure and remain bounded to costs that can be connected to specified transaction and governance mechanisms.

The fourth risk concerns path dependence. GRE's emphasis on history and open futures can resemble path-dependent analysis, yet the concepts operate at different levels. Path dependence requires a specified sequence-sensitive mechanism. Claims of lock-in, increasing returns, or quasi-irreversibility therefore require evidence beyond the general historical embeddedness of economic action.

The fifth risk concerns habits and agency. Institutional accounts of habitual conduct can illuminate subject formation while preserving actor reflexivity and innovation. GRE should therefore preserve the analytical distinction among habit, rule-following, strategic adaptation, learning, and deliberate institutional entrepreneurship rather than subsuming them under a single concept of relationally generated agency.

The sixth risk concerns efficiency and normativity. Institutional persistence, transaction-cost economizing, or adaptive fit carries no automatic inference of justice, desirability, or generative adequacy. An arrangement can be durable and low-cost for dominant participants while imposing unrecognized burdens on others. GRE can introduce heterogeneous value and justice questions, but those additions constitute an evaluative extension rather than an internal conclusion of institutional economics.

Proposition 21.327 (Institutional translation boundary). *Relational similarity between GRE and institutional economics supports dialogue only when the institutional mechanism, behavioral assumptions, historical scope, and evaluative criteria remain identifiable after translation.*

A final boundary concerns historical specificity. GRE's ontological suspension and relational pluralism can accommodate historically generated categories while preserving comparative explanation and conditional generalization across configurations. Institutional and historical economics remain capable of comparative explanation, causal inference, and conditional generalization. The appropriate translation therefore preserves both historical boundedness and the possibility of identifying mechanisms that recur across different institutional configurations.

The dialogue with institutional and historical economics consequently yields a strong methodological lesson for GRE. Relational analysis gains precision when it identifies the rules, organizations, habits, governance interfaces, and historical mechanisms through which a relation acquires practical force. Institutional economics, in turn, can be extended by tracing how those mechanisms alter heterogeneous values, capabilities, power relations, and future generativity. The two programmes overlap substantially, yet their explanatory tasks remain sufficiently distinct to justify continued theoretical plurality.

21.17 Behavioral and Experimental Economics

This section extends the theory-specific dialogue to behavioral and experimental economics. Its role is to examine approaches that place observed decision processes, psychologically plausible judgment, laboratory and field experimentation, and institutionally structured choice near the center of economic inquiry. The objective is interpretive and comparative. Behavioral economics and experimental economics overlap substantially, yet they remain analytically distinct: behavioral economics often studies systematic regularities in judgment and choice, while experimental economics supplies controlled methods for testing a wider range of economic theories, including theories compatible with conventional rational-choice models. The discussion proceeds through bounded rationality, heuristics, social preferences, framing, experimental design, and context, then develops a GRE relational reconstruction and identifies limits of translation. Table 21.17 summarizes the principal dialogue coordinates.

Definition 21.328 (Behavioral configuration). *A behavioral–experimental economic configuration is an analytically specified arrangement of subjects, tasks, information, incentives, institutional rules, representations, interaction partners, and observational procedures through which economic judgments, choices, and outcomes are generated and studied.*

The definition places behavior inside a structured configuration. Simon’s behavioral model of rational choice develops choice with explicit cognitive and informational limits on optimization (Simon 1955). Tversky and Kahneman identify economical judgment procedures and systematic framing effects (Tversky and Kahneman 1974; Tversky and Kahneman 1981). Experimental economics, especially in Smith’s methodological formulation, treats controlled environments and institutions as instruments for investigating how incentives, rules, and participant behavior jointly generate outcomes (V. L. Smith 1976; V. L. Smith 1982). The resulting research field therefore concerns both properties of decision makers and properties of the situations in which decisions become observable.

Proposition 21.329 (Behavioral–experimental reconstruction condition). *A relational reconstruction of behavioral and experimental economics should preserve the distinction among subject-level decision processes, experimentally induced conditions, institutional rules, representational frames, social interaction, and the inferential relation between observed behavior and broader economic conduct.*

21.17.1 Bounded Rationality

Bounded rationality provides the first coordinate because it changes the analytical status of the decision maker. Simon’s behavioral model reorients analysis toward the procedures through which a finite subject reaches a decision. It asks how choice can be represented when knowledge, computational capacity, search, and the structure of the decision environment limit the procedures available to an actor (Simon 1955). This shift makes the process of arriving at a decision analytically significant.

Definition 21.330 (Procedurally bounded choice). *Procedurally bounded choice is choice generated through a finite decision procedure whose information, search, rep-*

Table 21.17: Relational coordinates for behavioral and experimental economics

Coordinate	Behavioral–experimental analytical object	Dialogue boundary
Bounded rationality	Choice under finite cognition, information, search capacity, and procedural limits	Identification of boundedness with generic error or irrationality
Heuristics	Economical judgment procedures such as representativeness, availability, and anchoring	Treatment of heuristic use as a universal defect independent of task ecology
Social preferences	Fairness, reciprocity, relative standing, punishment, and other-regarding motives inferred from structured interactions	Conversion of observed experimental behavior into a complete theory of value or moral motivation
Framing	Dependence of expressed choice on problem representation, reference points, and presentation	Identification of every representational difference with a framing effect in the technical behavioral sense
Experimental design	Controlled manipulation of incentives, information, institutions, tasks, and observations	Inference from laboratory control to unrestricted external validity
Context	Cultural, institutional, social, selection, scrutiny, and task conditions shaping observed behavior	Treatment of context as an unspecified residual explanation
Relational reconstruction	Subject–task–frame–institution–history configurations generating observable choice	Absorption of psychological and experimental mechanisms into generic relational language
Translation limit	Remainder among behavioral mechanisms, experimental identification, and GRE categories	Identity inferred from shared attention to situated and relationally conditioned behavior

resentation, computational demands, and stopping conditions are limited relative to the full decision problem that an external analyst could specify.

The definition separates bounded rationality from simple suboptimality. A decision procedure can be well adapted to a local environment while remaining unable to evaluate every feasible alternative, future state, or consequence. Search may stop after an acceptable option is found; attention may be allocated selectively; categories may compress complex environments; and organizational routines may substitute for repeated global calculation. Rationality can therefore be assessed partly through the relation between procedure and environment alongside the conventional criterion of conformity to a globally maximizing solution.

GRE can translate this insight through the relation between a history-bearing subject and a locally accessible decision configuration. A subject encounters only a subset of potentially relevant information, carries acquired categories and routines, and acts through institutions that alter the cost and meaning of search. The feasible deci-

sion procedure is consequently relationally conditioned. Education, organizational position, technology, language, social trust, time pressure, and access to expertise can change the effective decision space even where nominal alternatives remain constant.

Proposition 21.331 (Procedural adequacy condition). *The adequacy of a bounded decision procedure depends on the relation among cognitive capacity, available information, institutional support, time, task structure, and the consequences of residual error; a procedure that is adequate in one configuration may become inadequate after those relations change.*

This formulation also creates a bridge to the earlier GRE analysis of epistemic economy. Scarcity of attention and interpretive capacity can affect economic conduct across subjects with otherwise different psychological capacities. An organization may compensate for individual limits through routines, division of cognitive labor, software, or expert institutions. The same devices can create new dependencies and new possibilities for manipulation. Bounded rationality therefore supports a relational inquiry into the infrastructures through which finite agents become capable of coordinated action.

The translation has a boundary. GRE's epistemic incompleteness is broader than behavioral bounded rationality. Ontological suspension, underdetermined inference, missing observations, and open future formation can limit inquiry even for an ideally capable reasoner. Bounded rationality concerns limits on actual decision procedures. The two concepts can interact, yet their explanatory levels should remain distinct.

21.17.2 Heuristics

Heuristics sharpen the analysis of bounded decision processes by identifying recurrent procedures used to make judgments under uncertainty. Tversky and Kahneman's classic account studies representativeness, availability, and adjustment from an anchor, describing them as economical procedures that are often effective while also generating systematic and predictable errors in specified tasks (Tversky and Kahneman 1974). The analytical object is therefore a structured judgment process with characteristic domains of usefulness and characteristic failure conditions.

Definition 21.332 (Heuristic judgment relation). *A heuristic judgment relation is a recurrent mapping from a decision cue or representation to a judgment through a simplified procedure that reduces informational or computational demands relative to fuller evaluation.*

Representativeness can substitute similarity judgments for probability assessment; availability can make ease of recall relevant to perceived frequency or plausibility; anchoring can make an initially accessible value shape subsequent numerical judgment. These mechanisms have different structures. Their common feature is compression: a difficult inferential problem is processed through a more tractable operation. A relational analysis should therefore preserve the specific cue, task, procedure, and error pattern and keep diverse mechanisms differentiated within the broader category of bias.

Prospect theory extends behavioral analysis into risky choice by modeling system-

atic departures from expected-utility descriptions, including reference-dependent evaluation and patterns associated with certainty and the presentation of prospects (Kahneman and Tversky 1979). The importance for GRE lies less in importing one behavioral value function than in recognizing that economically consequential evaluation can depend on relationally constituted reference conditions. Holdings, expectations, entitlements, recent trajectories, peer outcomes, institutional baselines, and narrative descriptions can each contribute to what a subject experiences as a gain, loss, improvement, or deterioration.

Proposition 21.333 (Heuristic localization condition). *A heuristic explanation should identify the decision task, informational cues, simplified procedure, and relevant performance criterion before a recurrent judgment pattern is generalized across contexts.*

GRE can extend this localization by asking how heuristic repertoires are acquired and stabilized. Professional training, organizational routines, technological interfaces, media environments, and repeated participation in specific markets may make some cues salient and others difficult to access. Such questions concern the historical formation of judgment procedures as well as their operation in a single choice episode.

This extension should preserve the behavioral mechanism. Relational language such as “context,” “history,” or “social influence” is too broad to substitute for evidence of representativeness, availability, anchoring, or another specified process. GRE adds questions about formation, distribution, infrastructure, and consequences after the local behavioral relation has been identified.

21.17.3 Social Preferences

Social-preference research provides a third coordinate by examining choices in which outcomes for other participants, relative payoff positions, reciprocity, punishment, or perceived fairness affect behavior. Ultimatum bargaining experiments made rejection behavior and proposal patterns observable within a simple strategic structure (Güth et al. 1982). Later formal models represented inequality aversion and relative payoff concerns as possible explanations for patterns across bargaining, cooperation, punishment, and competitive settings (Fehr and Schmidt 1999; Bolton and Ockenfels 2000).

Definition 21.334 (Socially conditioned preference expression). *A socially conditioned preference expression* is an observed choice pattern in which a subject’s decision varies with another participant’s payoff, conduct, intention, relative position, or institutionally mediated relation to the subject.

The phrase *preference expression* is deliberate. Experimental behavior supports bounded inference about motives under a specified design, while an exhaustive or context-invariant preference ordering requires additional evidence. A responder who rejects an unequal ultimatum offer may be influenced by inequality, reciprocity, norm enforcement, anger, strategic expectations formed outside the experiment, or combinations of these. Experimental design and repeated evidence can discriminate among mechanisms, yet inference from action to motive remains a theoretical task.

The social-preference literature is especially useful for relational economic analy-

sis because the same material payoff can acquire different behavioral significance across interaction structures. Fehr and Schmidt show that the economic environment can affect whether equity-motivated or materially self-regarding types dominate equilibrium behavior (Fehr and Schmidt 1999). Bolton and Ockenfels likewise model own payoff together with relative payoff standing across several laboratory settings (Bolton and Ockenfels 2000). These approaches make the relation among actor, counterpart, distribution, and institution part of the explanation.

Proposition 21.335 (Social-preference configuration condition). *An inference about social preference is strongest when the design separates own material payoff from the relevant relational variable and when alternative mechanisms such as strategic expectation, reputation, repeated interaction, and experimenter scrutiny are addressed by the identification strategy.*

GRE can extend the analysis in three directions. First, social relations are history-bearing: prior interaction, status, dependence, group membership, and remembered treatment may change the meaning of an otherwise identical allocation. Second, the objects evaluated can be heterogeneous. Money, recognition, dignity, obligation, reciprocity, belonging, and future access may remain only partially commensurable within one social-preference parameterization. Third, power can alter the feasible expression of social preferences. A participant may value fairness while lacking the institutional capacity to sanction an unfair arrangement outside a controlled experiment.

These extensions should preserve a distinction between descriptive preference models and normative evaluation. Evidence that subjects incur costs to punish inequality or reciprocate conduct describes a behavioral regularity; claims of justice, universality, or normative authority require a separate argument. GRE's heterogeneous value and justice analysis therefore begins after the descriptive mechanism has been specified.

21.17.4 Framing

Framing addresses the relation between representation and choice. Tversky and Kahneman demonstrate that different formulations of closely related decision problems can generate predictable shifts in expressed preference (Tversky and Kahneman 1981). Prospect theory had already linked risky choice to reference-dependent evaluation and to transformations in the presentation of prospects (Kahneman and Tversky 1979). Framing therefore makes the manifest form of a decision problem part of the causal analysis.

Definition 21.336 (Decision frame). *A decision frame is the representation through which a choice problem is presented or construed, including the reference point, outcome description, categorization, probability presentation, and other features that organize how alternatives enter evaluation.*

This concept has a direct interface with GRE's distinction between relational and manifestational reality. Economic subjects rarely encounter an entire underlying configuration. They encounter descriptions, interfaces, classifications, prices, rankings, contractual clauses, dashboards, narratives, or institutional categories through which portions of the configuration become actionable. A change in manifestation

can alter action even where some underlying material consequences remain similar.

The analogy requires discipline. Behavioral framing is an empirically specified effect in which changes in representation alter choice under a controlled or otherwise identified comparison. GRE's manifestation reality is a broader epistemic category. It includes representation, observation, measurement, and context-dependent presentation even where no framing effect has been demonstrated. The broader category can help generate hypotheses about economically consequential representations, while behavioral evidence is required to establish the local choice effect.

Proposition 21.337 (Frame-manifestation distinction). *A GRE manifestation becomes a behavioral decision frame only when the representation can be connected to a specified choice process and to an observable difference in judgment or action under an appropriate comparison.*

This distinction is particularly important in digitally mediated economies. Default settings, interface ordering, labels, recommendation displays, price partitions, performance metrics, and AI-generated summaries can organize the manifestation through which subjects perceive alternatives. GRE can ask who designs these interfaces, whose interests shape the available representations, which alternatives remain visible, and how repeated exposure changes later expectations. Behavioral framing research supplies a more local empirical vocabulary for testing particular mechanisms within that wider relational architecture.

21.17.5 Experimental Design

Experimental design supplies the methodological core of experimental economics. Smith's induced-value framework shows how experiments can establish controlled incentives and observable institutional conditions for the testing of economic propositions (V. L. Smith 1976). His later account of microeconomic systems emphasizes the joint role of environments, institutions, and behavior in producing experimental outcomes (V. L. Smith 1982). This methodological tradition is broader than behavioral economics because controlled experiments can test market convergence, auction institutions, information structures, coordination mechanisms, and other propositions independently of any prior hypothesis of psychological bias.

Definition 21.338 (Experimental economic system). *An experimental economic system is a deliberately constructed arrangement in which relevant features of participant endowments or incentives, information, institutional rules, interaction protocols, and observable outcomes are specified sufficiently to support controlled comparison and causal or theoretical inference.*

Control has epistemic value because it creates contrasts that are difficult to obtain in many naturally occurring economies. A market institution can be varied while induced values are held stable; an information condition can be changed while the payoff structure remains fixed; a bargaining rule can be modified across otherwise comparable sessions. Such designs allow the analyst to connect observed differences to a narrower set of candidate causes.

Proposition 21.339 (Experimental identification condition). *The inferential value of an economic experiment depends on the alignment among the theoretical object, exper-*

imental manipulation, incentive structure, comparison condition, measurement procedure, and the population or domain to which the result is interpreted.

From a GRE perspective, experimental design can be understood as deliberate construction of a local relational configuration. The experimenter specifies roles, admissible actions, information channels, temporal order, payoff consequences, interaction partners, and recording procedures. The resulting observations are therefore generated within a designed relational architecture. This feature is a strength because causal relations can be isolated. It also establishes the scope of the claim: an experiment identifies behavior under the constructed configuration, and broader generalization requires additional argument.

Experimental economics also offers an important corrective to any tendency in GRE to treat naturally occurring complexity as analytically inaccessible. A relational system can sometimes be decomposed into experimentally tractable interfaces. Market rules, communication protocols, ownership arrangements, matching procedures, or information structures can be varied in controlled environments to test mechanisms derived from a broader relational theory. Experimental construction can therefore become one component of GRE's methodological pluralism.

The reverse correction is equally important. Experimental identification retains a distinct evidential role where a feasible causal contrast can separate competing mechanisms. Claims that a frame, institution, norm, or interaction structure changes behavior should be tested through designs capable of separating that mechanism from competing explanations whenever the research question permits such control.

21.17.6 Context

Context becomes an explicit analytical object when behavior varies across populations, institutions, tasks, or observational settings. Cross-societal experiments reported by Henrich and colleagues document substantial variation across fifteen small-scale societies, challenging the presumption that behavior observed in one familiar participant population supplies a universal benchmark (Henrich et al. 2001). Levitt and List analyze how scrutiny, context, participant selection, and task selection can generate differences between laboratory behavior and naturally occurring conduct (Levitt and List 2007). These contributions make external validity a graded and structured problem of transport across settings.

Definition 21.340 (Behavioral context). A *behavioral context* is the set of social, institutional, cultural, historical, material, and observational conditions that can alter the interpretation, incentives, expectations, or action possibilities associated with a decision task.

Context should remain analytically typed. Cultural norms, market familiarity, anonymity, repeated interaction, experimenter presence, legal institutions, income levels, status relations, linguistic categories, and recruitment procedures can influence behavior through different mechanisms. A context claim gains explanatory value when the relevant relation is identified. The methodological task is to determine which contextual dimension changes the observed behavior and through what pathway.

Proposition 21.341 (Contextual transport condition). *Transporting an experimental result to another population or setting requires an argument that the relations essential to the identified mechanism are sufficiently preserved, or an explicit model of how changes in those relations alter the expected outcome.*

This proposition gives GRE a precise use for its emphasis on history and relational configuration. External validity can be analyzed as a problem of relational transport. The analyst asks which elements of the experimental configuration are mechanism-essential, which are incidental, and which corresponding relations exist in the target setting. A laboratory result may travel well when the relevant incentives and institution are tightly replicated. It may travel poorly when identity, repeated relations, enforcement, or historical expectations are central to the naturally occurring decision.

Context also operates inside laboratories. Subjects interpret instructions through prior language and experience; money can carry different marginal significance; anonymity is experienced relative to expectations about social observation; and unfamiliar games can be understood through analogies to known social situations. Controlled design reduces many sources of variation while leaving some interpretive relations active. This clarification strengthens experimental interpretation by identifying the empirical work required to determine the domain across which a mechanism remains stable.

21.17.7 Relational Reconstruction

The preceding coordinates support a relational reconstruction centered on the production of observable choice within a configured relation among subject, task, representation, institution, counterpart, history, and measurement. Behavioral and experimental economics already contain important elements of such an architecture. Bounded rationality links decision procedures to finite capabilities and environments; heuristic research links judgments to cues and task representations; social-preference research links behavior to counterpart outcomes and interaction structures; framing links choice to manifestation; experimental economics links outcomes to controlled institutions and incentives; and external-validity research links observed behavior to population and context.

Definition 21.342 (Relational choice configuration). *A relational choice configuration is a history-bearing arrangement $\mathcal{C}$ consisting of a subject, a feasible action set, information and representations, institutional rules, material and social consequences, relevant counterpart relations, and a temporal context through which an observable choice is generated.*

The symbol $\mathcal{C}$ serves only as a compact label for the configuration described in the definition and carries only the analytical commitments stated here. Different research designs can operationalize the components through experiments, field data, qualitative evidence, or formal models. The key analytical move indexes the observed choice to a configuration and treats subject-level behavior as configuration-dependent evidence.

Proposition 21.343 (Configuration-indexed behavior). *An observed behavioral regularity supports inference about a broader class of economic situations to the extent*

that the mechanism-relevant relations of the originating configuration remain stable, are appropriately transformed, or are explicitly modeled in the target class.

GRE extends this architecture by adding questions about formation and consequence. How did the subject acquire the categories used in the task? Which institutions produced the available action set? Who controls the representation through which alternatives appear? Which values are omitted by the experimental payoff structure? How do repeated interactions alter future capabilities, trust, or dependence? Which actors possess the power to redesign the choice architecture? These questions move from local behavior toward the generative history and downstream effects of the configuration.

A second extension concerns heterogeneous value. Experimental payoffs are powerful precisely because they simplify and control incentives. Naturally occurring action can involve monetary payoff, time, recognition, identity, care, status, obligation, security, ecological consequence, and future access at once. GRE can use experimental methods to isolate selected value relations while retaining a broader account of the values left outside a particular design. This combination prevents experimental tractability from being mistaken for ontological completeness.

A third extension concerns relational intervention. Behavioral findings are often used to redesign defaults, information, incentives, or decision environments. GRE asks about the second-order consequences of such interventions: who acquires design authority, how repeated nudges alter capability and dependence, whether a short-run behavioral improvement changes long-run learning, and how benefits and burdens are distributed across subjects. Behavioral effectiveness and generative evaluation therefore occupy connected but distinct analytical levels.

Proposition 21.344 (Behavioral intervention extension). *A GRE evaluation of a behaviorally informed intervention should consider the identified local behavioral effect together with changes in capability, dependence, institutional power, heterogeneous value, and future option structure produced by repeated operation of the intervention.*

The domain of adequacy for behavioral and experimental economics is substantial. These approaches are especially powerful when a research question can be expressed through observable choice, when competing mechanisms can be separated by controlled comparison, when psychologically plausible procedures matter to prediction, or when institutional rules can be experimentally varied. GRE gains empirical discipline from this tradition because relational claims become more useful when they generate testable contrasts and move beyond broad contextual description.

21.17.8 Limits of Translation

Translation between behavioral and experimental economics and GRE encounters several boundaries. The first concerns explanatory scale. Behavioral economics often isolates mechanisms operating within a decision episode or a repeated class of decisions. GRE frequently asks how the decision subject, institutional environment, value structure, and available relations were historically generated. A successful local behavioral mechanism can therefore remain compatible with several different accounts of the wider relational history.

Definition 21.345 (Behavioral translation remainder). A *behavioral translation remainder* is the explanatory content of a behavioral mechanism or experimental identification strategy that depends on a specified psychological process, controlled manipulation, incentive structure, or inferential contrast and remains irreducible to a generic relational description alone.

The second boundary concerns bounded rationality. GRE's broader epistemic limits include inaccessible information, underdetermination, ontological suspension, and open future formation. These conditions can persist independently of cognitive capacity. Treating them as psychological boundedness would conflate properties of inquiry with properties of a decision procedure.

The third boundary concerns heuristics and bias. A relational account can explain why particular cues become available or socially salient, yet a heuristic claim requires evidence of the relevant judgment procedure. Historical or institutional context can modify the operation of a heuristic while its cognitive specification remains analytically identifiable.

The fourth boundary concerns social preferences. Fairness, reciprocity, relative payoff standing, and punishment are empirically valuable constructs. GRE's heterogeneous value vocabulary is broader and can include forms of value that are absent from an experimental payoff function. Conversely, attribution of a GRE value category to a given choice requires direct empirical evidence linking that category to the subject's conduct. Translation therefore requires empirical linkage beyond conceptual resemblance.

The fifth boundary concerns framing. GRE's manifestation layer includes any context-dependent presentation through which a relational reality becomes accessible. Behavioral framing identifies a narrower causal dependence of choice on representation. The former can organize research questions; the latter requires an identified behavioral comparison.

The sixth boundary concerns experiments as representations of economic worlds. Experimental control deliberately removes many relations in order to identify others. GRE should regard this reduction as an epistemic operation with a defined purpose. A laboratory market can illuminate price formation under specified rules while deliberately abstracting from much of the history, power structure, social meaning, and ecological embedding of a naturally occurring market.

Proposition 21.346 (Experimental translation boundary). *Relational reconstruction preserves the evidential force of an experiment only when the experimentally controlled variables, comparison structure, behavioral mechanism, and intended domain of generalization remain identifiable after translation.*

A seventh boundary concerns normativity. The desirability of exploiting, correcting, or preserving a predictable behavioral effect requires a separate normative judgment. A policy may increase compliance or welfare under one metric while changing autonomy, capability, trust, surveillance, or institutional dependence. Behavioral evidence can inform normative inquiry while leaving the normative ordering open to separate evaluation.

An eighth boundary concerns heterogeneity within the field. Simon's procedural approach, heuristics-and-biases research, prospect theory, social-preference models,

and Smithian experimental economics differ in theoretical object and method. Their coexistence within one section reflects disciplinary dialogue and preserves their theoretical plurality. The GRE translation should therefore remain many-to-many: different behavioral and experimental programmes can illuminate different portions of a relational economic configuration.

The dialogue yields a reciprocal methodological lesson. Behavioral and experimental economics can discipline GRE by requiring relational claims to specify observable mechanisms, contrasts, and domains of validity. GRE can widen the behavioral–experimental research question by tracing how decision procedures, representations, experimental analogues, and interventions arise from history-bearing institutional relations and how they reshape later capabilities and possibilities. The overlap is productive precisely because the traditions retain distinct explanatory commitments.

21.18 Evolutionary and Complexity Economics

This section extends the theory-specific dialogue to evolutionary and complexity economics. Its role is to examine traditions that place heterogeneity, interaction, adaptation, innovation, selection, emergence, network structure, and historically generated dynamics near the center of economic explanation. The objective is comparative and interpretive. Evolutionary economics and complexity economics overlap substantially, especially in their attention to endogenous change and heterogeneous agents, yet they retain distinct intellectual lineages and modeling commitments. Evolutionary economics commonly emphasizes routines, innovation, selection, technological trajectories, and coevolution, whereas complexity economics often emphasizes interacting adaptive agents, decentralized pattern formation, feedback, networks, and persistent non-equilibrium processes. The discussion proceeds through heterogeneity, interaction, adaptation, emergence, non-equilibrium dynamics, networks, and path dependence, then develops a GRE relational reconstruction and identifies limits of translation. Table 21.18 summarizes the principal dialogue coordinates.

Definition 21.347 (Evolutionary–complexity configuration). An *evolutionary–complexity economic configuration* is an analytically specified arrangement of heterogeneous agents, organizations, technologies, routines, institutions, interaction structures, selection environments, and historical conditions whose repeated interaction can modify both participant characteristics and aggregate economic patterns over time.

The definition provides a common comparative coordinate without identifying the two traditions. Nelson and Winter’s evolutionary theory treats firms as carriers of routines whose search, innovation, and competitive selection contribute to industrial change (Nelson and Winter 1982). Dosi’s account of technological paradigms and trajectories emphasizes structured directions of technical change and discontinuities associated with new paradigms (Dosi 1982). Arthur’s complexity formulation emphasizes heterogeneous adaptive agents whose actions alter the aggregate environment to which they subsequently respond (Arthur 1999). Agent-based computational economics provides a constructive methodology for studying decentralized systems in which heterogeneous agents interact, learn, and generate institutional or aggregate

outcomes (Tsfatsion 2006). The shared territory therefore concerns economic processes in which the conditions of action can themselves change through economic action.

Proposition 21.348 (Evolutionary–complexity reconstruction condition). *A relational reconstruction of evolutionary and complexity economics should preserve the distinction among heterogeneity, interaction mechanisms, adaptation or search, selection, emergent aggregate patterns, network topology, historical sequence, and the institutional conditions that shape their coupling.*

21.18.1 Heterogeneity

Heterogeneity provides the first coordinate because evolutionary and complexity approaches commonly begin with persistent differences that affect subsequent economic change. Firms may differ in routines, productive capabilities, technological knowledge, organizational structures, expectations, search procedures, or strategic positions. Agents in complexity models may also differ in rules, information, beliefs, resources, or locations. These differences can influence both immediate behavior and the later distribution of surviving or expanding practices.

Definition 21.349 (Economically consequential heterogeneity). *Economically consequential heterogeneity* is a distribution of differences among economic participants or configurations whose persistence or transformation changes interaction, selection, adaptation, diffusion, or aggregate outcomes within the domain being studied.

Nelson and Winter make heterogeneity analytically central through firm-specific routines and differential search, allowing industrial populations to change as firms expand, contract, imitate, innovate, and exit (Nelson and Winter 1982). Metcalfe similarly places variety among firms and innovation within an evolutionary account of competition and creative destruction (Metcalfe 1998). Complexity economics extends the relevance of heterogeneity by examining systems in which differently situated agents adapt to patterns partly generated by their own collective activity (Arthur 1999). Heterogeneity therefore operates as a potential source of differential response and system-level change.

The analytical significance of a difference depends on the mechanism connecting it to outcomes. Variation in a firm's routines matters when routines affect production, innovation, search, or survival. Variation in expectations matters when expectations alter investment, trading, or coordination. Variation in network position matters when connectivity changes information, exposure, bargaining, or diffusion. A catalogue of differences does not yet constitute an evolutionary explanation.

Proposition 21.350 (Mechanism-indexed heterogeneity). *Heterogeneity becomes explanatory when a specified mechanism links differences among participants or configurations to differential behavior, interaction, adaptation, selection, reproduction, or future opportunity.*

GRE can translate this point through heterogeneous generative capacity, heterogeneous conversion possibilities, and differentiated relational position. Two organizations with similar measured resources may generate different future possibilities because their histories, routines, trust relations, knowledge, infrastructures, or insti-

Table 21.18: Relational coordinates for evolutionary and complexity economics

Coordinate	Evolutionary–complexity analytical object	Dialogue boundary
Heterogeneity	Persistent differences in routines, capabilities, expectations, technologies, strategies, and organizational forms	Treatment of heterogeneity as an unspecified residual or as sufficient by itself to generate complex dynamics
Interaction	Local, strategic, institutional, market, and network-mediated coupling among heterogeneous participants	Identification of every economic relation with the interaction mechanisms used in a particular model
Adaptation	Search, learning, routine modification, innovation, imitation, selection, and coevolution	Reduction of adaptation to universal optimization or to biological replication by analogy alone
Emergence	Aggregate regularities generated through decentralized interactions and feedback	Use of emergence as a substitute for specifying generative mechanisms or levels of analysis
Non-equilibrium dynamics	Ongoing adjustment, innovation, feedback, transient states, and endogenous structural change	Rejection of equilibrium concepts even where they remain useful local benchmarks or limiting cases
Networks	Topologies of interaction, dependence, diffusion, intermediation, and coevolving connectivity	Identification of graph structure with the full relational content of economic life
Path dependence	Sequence-sensitive development produced by specified reinforcing, learning, coordination, or institutional mechanisms	Treatment of every historical influence as path dependence or every persistence as lock-in
Relational reconstruction	History-bearing configurations in which relations, capacities, constraints, and structures can change together	Absorption of evolutionary and complexity mechanisms into generic relational vocabulary
Translation limit	Remainders among evolutionary mechanisms, complexity formalisms, network representations, and GRE concepts	Identity inferred from shared attention to history, interaction, heterogeneity, or endogenous change

tutional permissions differ. This translation broadens the object while preserving the evolutionary requirement that differences acquire explanatory force through identifiable processes.

The boundary is equally important. GRE should not infer that every difference is economically salient or that greater diversity is intrinsically beneficial. Heterogeneity can support experimentation and resilience under some conditions; it can also

reflect exclusion, unequal access, segmentation, or incompatible standards. Its economic significance remains configuration-specific.

21.18.2 Interaction

Interaction provides the second coordinate because the consequences of heterogeneity depend on how heterogeneous participants encounter one another. Evolutionary competition, imitation, technological diffusion, organizational learning, strategic adjustment, and institutional coevolution all require channels through which actions and states become mutually consequential. Complexity economics makes this coupling especially explicit by treating aggregate patterns as products of repeated interactions among locally informed or adapting agents.

Definition 21.351 (Endogenously consequential interaction). *An endogenously consequential interaction is an encounter or coupling in which the action, state, rule, position, or expectation of one participant changes conditions relevant to the subsequent behavior or state of another participant or of the interaction structure itself.*

Arthur's complexity account emphasizes a recursive relation: agents react to aggregate patterns that their own actions help create, so expectations and strategies can be continually revised as the system evolves (Arthur 1999). Agent-based computational economics operationalizes related ideas by constructing artificial economies in which decentralized agents interact under specified institutional rules and the resulting system history is generated through simulation (Tesfatsion 2006). Epstein and Axtell's bottom-up artificial-society approach similarly demonstrates how repeated local interaction can be used to investigate the generation of aggregate social patterns (Epstein and Axtell 1996).

Interaction can be direct, mediated, or institutionally transformed. A firm's innovation may alter a competitor's search problem without direct communication. A price can mediate interaction among participants who never meet. A platform can reorder visibility and access among producers and consumers. A legal rule can change which interactions are possible and what consequences follow from them. The relevant interaction architecture therefore includes channels, interfaces, timing, information, and institutional conditions.

Proposition 21.352 (Interaction-architecture condition). *The consequences of heterogeneous behavior depend on the architecture through which participants are coupled, including the topology, timing, information conditions, institutional rules, and feedback pathways that transmit or transform their effects.*

This proposition creates a direct dialogue with GRE's relational emphasis while preserving a distinction. GRE uses relation in a broader sense than many interaction models. Ownership, historical obligation, legal status, inherited dependency, shared infrastructure, and symbolic recognition can remain economically consequential even when no contemporaneous bilateral interaction occurs. Complexity models can represent some of these features, yet a modeled interaction rule should not automatically be identified with the complete relational structure of the corresponding economic configuration.

21.18.3 Adaptation

Adaptation provides the third coordinate because evolutionary and complexity economics analyze economic participants whose behavior or organization can change in response to experience, competition, technological opportunity, or environmental transformation. The relevant processes include search, learning, imitation, experimentation, innovation, routine modification, entry, exit, and selection. Their diversity matters because different adaptive mechanisms generate different economic dynamics.

Definition 21.353 (Economic adaptation). *Economic adaptation* is a process through which an economic participant, population, or configuration changes behavior, routines, capabilities, strategies, organization, or composition in response to experienced conditions, generated variation, selection pressures, or changing environments.

Schumpeter's account of development gives innovation a discontinuous role through new combinations that disturb established economic reproduction (Schumpeter 1934). Nelson and Winter formalize evolutionary change through routines, search, innovation, and selection among heterogeneous firms (Nelson and Winter 1982). Alchian shows how selection under uncertainty can retain viable practices even when observed success does not arise from complete foresight or explicit global maximization (Alchian 1950). Dosi's technological paradigms and trajectories locate innovative search within historically structured problem spaces with bounded directions of technically meaningful advance (Dosi 1982).

Adaptation therefore differs from a single optimizing response. Some adaptive processes are deliberate and reflective; others arise from organizational routines, imitation, trial and error, or population selection. Learning can improve performance relative to one criterion while creating dependence on a narrow trajectory. Selection can remove some forms while retaining others without demonstrating their normative superiority. Innovation can expand opportunities for some participants while closing established paths for others.

Proposition 21.354 (Plural adaptation mechanisms). *Evolutionary explanation should identify the mechanism through which change occurs—including search, learning, imitation, innovation, routine revision, selection, or coevolution—because these mechanisms imply different causal pathways and different interpretations of observed persistence or success.*

GRE can extend the analysis by asking how adaptive processes alter later generative capacities and relational conditions. A new technology may improve productivity while redistributing skill requirements, dependence, bargaining positions, environmental burdens, and access to future innovation. An organizational routine may stabilize cooperation while narrowing responsiveness to unfamiliar conditions. Adaptation thus becomes simultaneously a response to an inherited configuration and a contributor to the configuration faced later.

The biological analogy requires restraint. Hodgson's reconstruction of evolutionary economics explicitly distinguishes useful evolutionary principles from genetic reductionism and automatic progress narratives (Hodgson 1993). Hodgson and Knudsen develop variation, inheritance, and selection as high-level evolutionary principles while recognizing the need for domain-specific mechanisms in social and eco-

conomic settings (Hodgson and Knudsen 2010). GRE should preserve the same discipline: relational inheritance, institutional reproduction, and organizational routine can be analyzed evolutionarily without presuming biological identity.

21.18.4 Emergence

Emergence provides the fourth coordinate because complexity analysis often investigates aggregate patterns whose organization cannot be read directly from the isolated properties of individual participants. Market conventions, spatial clustering, technological dominance, organizational ecologies, or systemic regularities may arise through repeated interaction and feedback. The analytical burden lies in specifying how the macro-pattern is generated and how it subsequently affects local behavior.

Definition 21.355 (Mechanism-grounded emergence). *Mechanism-grounded emergence* is the generation of a higher-level regularity, structure, or pattern through specified interactions among lower-level or component processes, where the generated pattern subsequently has an identifiable analytical description and may alter conditions for later component behavior.

Simon emphasizes hierarchical and near-decomposable organization as recurring features of complex systems and as methodological resources for analyzing systems across levels (Simon 1962). Holland develops complex adaptive systems through evolving signals, boundaries, and hierarchical organization (Holland 2012). In economic applications, agent-based models can make emergence operational by specifying local rules and examining the aggregate histories they generate (Epstein and Axtell 1996; Tesfatsion 2006).

Emergence should therefore carry explicit explanatory obligations. The investigator should specify the relevant components, interaction rules, temporal sequence, aggregation procedure, and evidence connecting the generated pattern to an empirical economic object. A simulated regularity establishes what a model can generate under stated conditions; it does not by itself establish that the same mechanism produced an observed historical outcome.

Proposition 21.356 (Emergence-evidence distinction). *A demonstrated emergent pattern in a formal or computational model establishes a generative possibility within that model; empirical explanation additionally requires evidence that the model's mechanisms, boundary conditions, and relevant scale correspond adequately to the economic process being explained.*

This distinction is particularly important for GRE. GRE's language of generativity concerns the production, transformation, preservation, or closure of future possibilities across relational configurations. Complexity emergence concerns the generation of higher-level patterns from interacting processes. The concepts can intersect when emergent structures alter later opportunity sets, yet generativity is neither a synonym for emergence nor a claim that every macroeconomic pattern arises through the same micro-to-macro mechanism.

GRE also permits downward or cross-level effects without treating them as mysterious. Once an institution, standard, platform, convention, or organizational structure becomes sufficiently stable to organize action, it can change the constraints and possi-

bilities encountered by participants. The resulting configuration is recursively structured: local interactions contribute to larger patterns, and stabilized larger patterns condition subsequent local interactions.

21.18.5 Non-Equilibrium Dynamics

Non-equilibrium dynamics provide the fifth coordinate because evolutionary and complexity approaches commonly treat change as constitutive of the economic object. Innovation, entry, exit, technological diffusion, expectation revision, network rewiring, institutional transformation, and cumulative feedback can occur while the system is moving through states that are transient or historically contingent. Analysis therefore concerns trajectories and processes alongside, and sometimes in place of, stationary configurations.

Definition 21.357 (Process-dominant economic dynamics). *Process-dominant economic dynamics* are economic dynamics in which ongoing adaptation, innovation, interaction, or structural transformation is sufficiently consequential that the trajectory of change forms part of the explanatory object and cannot be represented adequately as only an adjustment path toward a predetermined equilibrium state.

Metcalfé's evolutionary treatment of competition centers economic change and differential firm performance across an evolving competitive process (Metcalfé 1998). Arthur's complexity formulation similarly presents an economy in which agents continually adjust to patterns generated by the system itself (Arthur 1999). Nelson's account of coevolution among technology, industrial structure, and supporting institutions further illustrates how several components of an economic system can change reciprocally through mutually conditioning paths (Nelson 1994).

The analytical importance of non-equilibrium reasoning depends on the research problem. Equilibrium concepts can remain useful for local comparison, for identifying rest points of a model, for characterizing benchmark allocations, or for separating transient from persistent forces. Evolutionary and complexity economics expand the toolkit by making room for cases in which innovation and adaptation continually change the state space or the behavioral rules relevant to the system.

Proposition 21.358 (State-space revisability). *Where innovation, institutional change, or adaptation modifies the feasible actions, participant types, interaction rules, or relevant economic objects, an adequate dynamic representation may require revision of the state space as well as movement within it.*

This proposition connects strongly with GRE's open-future orientation. A new institution or technology can create categories of action that were previously unavailable, making economic change partly a transformation of possibilities. GRE nevertheless adds an epistemic caution: openness of the future can arise from incomplete knowledge, endogenous novelty, relational reconfiguration, or several of these together. A non-equilibrium model captures the mechanisms it explicitly represents and should not be treated as proof that the economic future is ontologically indeterminate in every relevant sense.

The same caution applies to criticality. Complexity economics can motivate inquiry into nonlinear transitions, cascades, or sensitivity to system structure, yet GRE should

invoke criticality only where a model or empirical analysis supports the relevant dynamical properties. Persistent disequilibrium, volatility, or structural change does not by itself establish proximity to a critical point.

21.18.6 Networks

Networks provide the sixth coordinate because interaction is often structured by topology. Economic participants differ not only in attributes but also in whom they can reach, depend upon, observe, imitate, finance, employ, supply, or influence. Network representations make these patterns explicit and can reveal how local connectivity shapes diffusion, concentration, vulnerability, coordination, and systemic propagation.

Definition 21.359 (Economic interaction network). *An economic interaction network is a graph-based representation in which nodes denote specified economic units and edges denote specified relations or interaction channels whose topology is relevant to the economic mechanism under study.*

Newman's review establishes a general network-science framework for studying degree distributions, clustering, correlations, growth, and dynamical processes on networks (Newman 2003). Multilayer-network analysis extends this representation to systems containing several relation types or interconnected layers (Kivelä et al. 2014). Adaptive-network research further allows the states of nodes and the topology connecting them to coevolve through feedback (Gross and Blasius 2008). These tools are especially relevant to economic systems in which trading relations, credit exposures, supply links, information channels, ownership, or platform connections have distinct structures.

Proposition 21.360 (Topology-mechanism coupling). *A network representation contributes economic explanation when a specified topological property changes a specified mechanism such as diffusion, exposure, bargaining, contagion, intermediation, search, coordination, or access.*

GRE can use network representations as partial manifestations of relational structure. They can expose positions, pathways, bottlenecks, communities, multiplex relations, and changing connectivity. Network analysis can also clarify how a local allocation or institutional intervention propagates through a wider configuration. A credit guarantee, platform-ranking rule, logistics disruption, or information standard may have effects that depend strongly on network position and on the relation type being modeled.

The translation boundary is substantial. A graph edge records only the relation encoded by the analyst. Two firms connected by a supply edge may also be linked by ownership, legal obligation, historical trust, shared labor markets, standards, or political institutions that are absent from the graph. Conversely, a dense graph does not necessarily imply a socially strong relationship if the encoded edges represent weak or transient transactions. GRE's relational reality is therefore broader than graph topology, while network science provides a precise family of representations for particular relational dimensions.

21.18.7 Path Dependence

Path dependence provides the seventh coordinate because evolutionary and complexity economics treat historical sequence as potentially causally consequential. Technologies, standards, routines, institutions, expectations, and network structures can develop through mechanisms in which earlier events alter the returns, constraints, or opportunities associated with later choices. Historical influence becomes path dependence when the sequence itself enters the mechanism.

Definition 21.361 (Mechanism-specific path dependence). *Mechanism-specific path dependence* is sequence-sensitive economic development in which earlier events or states modify later transition possibilities through an identifiable mechanism such as increasing returns, learning, coordination, sunk investment, institutional reproduction, adaptive expectations, or network reinforcement.

Arthur's analysis of competing technologies shows how increasing returns can make early historical events consequential for later adoption and can produce lock-in under specified conditions (Arthur 1989). David's historical analysis of the QWERTY keyboard likewise helped establish a research programme concerned with sequence, compatibility, learning, and historically accumulated coordination (David 1985). Dosi's technological trajectories and Nelson's coevolutionary analysis broaden the inquiry toward structured innovative search and reciprocal development among technologies, industries, and institutions (Dosi 1982; Nelson 1994).

Proposition 21.362 (Historical-sequence condition). *A claim of path dependence should identify how an earlier event or state changes later transition probabilities, costs, returns, capabilities, rules, or feasible alternatives; historical chronology alone is insufficient.*

This condition is especially important for GRE because the framework assigns strong analytical significance to history-bearing configurations. GRE can ask how past relations remain embedded in present capabilities, infrastructures, obligations, symbolic classifications, institutional permissions, or value-conversion pathways. The evolutionary literature supplies a discipline for specifying the mechanism through which such historical embedding persists.

Path dependence also differs from irreversibility and lock-in. A process can be path dependent while remaining reversible at some cost. A configuration can be difficult to reverse for physical, legal, political, or organizational reasons without having arisen through an increasing-returns mechanism. Lock-in is therefore a stronger and more specific condition than the general proposition that history matters.

The normative status of a path also remains open. Persistence may preserve valuable accumulated coordination or knowledge; it may also reproduce exclusion, technological rigidity, ecological damage, or unequal access. Historical survival demonstrates reproduction under particular conditions rather than social desirability.

21.18.8 Relational Reconstruction

The preceding coordinates support a relational reconstruction centered on history-bearing economic configurations whose participants, relations, capacities, constraints, and interaction structures can change together. Evolutionary and com-

plexity economics already supply many of the mechanisms required for such a reconstruction. GRE's contribution is primarily architectural: it places these mechanisms within a broader account of heterogeneous value, power, epistemic access, conversion, generativity, and open future formation while preserving their local explanatory specificity.

Definition 21.363 (Evolutionary relational reconstruction). An *evolutionary relational reconstruction* represents an economic process as a history-bearing configuration in which heterogeneous participants interact through structured relations, adapt or are differentially selected, generate aggregate patterns, modify the interaction environment, and thereby alter the conditions of subsequent economic action.

The reconstruction has several components. First, heterogeneity becomes relationally situated. Differences in capabilities, routines, technologies, or expectations are analyzed together with the institutions and positions that make those differences consequential. Second, interaction is specified as an architecture with identifiable channels, timing, rules, and interfaces. Market rules, organizational boundaries, legal rights, platform interfaces, and network topology can alter the pathways through which local behavior becomes systemically consequential.

Third, adaptation and selection are connected to generative consequences. Innovation can create new productive capacities, new occupations, new standards, or new dependencies. Selection can change the population of firms or routines while also redistributing knowledge and access. Coevolution can modify several linked structures simultaneously. The relevant evaluative question therefore extends beyond whether an adaptive process survives competition to what future possibilities it creates, preserves, transfers, or closes for differently positioned participants.

Proposition 21.364 (Generative extension of evolutionary change). A GRE extension of evolutionary change examines both the mechanisms that generate and select variation and the downstream changes those mechanisms produce in capabilities, relational positions, value-conversion pathways, and future opportunity structures.

Fourth, emergence is connected to institutional stabilization. A recurrent pattern generated through interaction may become encoded in rules, infrastructures, expectations, categories, or organizations. Once stabilized, it can become part of the relational environment within which later behavior occurs. This produces a recursive architecture in which emergent outcomes can become conditions for later emergence.

Fifth, network structure is integrated with broader relational content. A graph can represent one or several economically important relation types while GRE records the possibility that additional institutional, legal, symbolic, ecological, or historical relations remain relevant outside the graph. This permits network precision without reducing relational reality to topology.

Sixth, evolutionary and complexity methods can discipline GRE's own formal claims. Agent-based simulation can test whether a proposed local mechanism is capable of generating an aggregate pattern. Network analysis can expose structural positions and propagation channels. Evolutionary models can distinguish variation, inheritance, selection, and adaptation. Historical evidence can assess whether the modeled mechanisms correspond to actual sequences. These methods therefore provide routes from broad relational hypotheses toward more discriminating empirical

or computational inquiry.

Proposition 21.365 (Reciprocal methodological discipline). *Evolutionary, complexity, agent-based, and network methods can strengthen GRE when they convert broad relational claims into mechanism-specific, scale-specific, and empirically contestable representations; GRE can reciprocally widen those representations by tracing power, heterogeneous value, historical embedding, and downstream generative consequences that a local model may omit.*

The reconstruction remains plural. A Nelson–Winter model of industrial evolution, an Arthur-style adaptive system, an agent-based artificial economy, and a multilayer network model do not become instances of a single formal object merely because each studies endogenous change. Their analytical units, mechanisms, evidential warrants, and mathematical structures can remain distinct within the common relational dialogue.

21.18.9 Limits of Translation

The translation between evolutionary and complexity economics and GRE remains partial. Shared attention to history, interaction, heterogeneity, endogenous change, and nonlinearity creates substantial overlap, yet the concepts operate at different levels and carry different methodological commitments. Several boundaries should remain visible.

The first boundary concerns evolution. Evolutionary economics contains multiple traditions, including Schumpeterian innovation, selection-based arguments, routine-based firm evolution, technological trajectories, and generalized Darwinian proposals. GRE can translate their relational implications while preserving their differences. The vocabulary of generation does not supply a replacement for variation, inheritance, selection, routine, search, or innovation when those mechanisms are doing explanatory work.

The second boundary concerns adaptation. Adaptive behavior can arise through learning, imitation, search, routine revision, population selection, or algorithmic updating. GRE's history-bearing subject does not determine which mechanism operates. Empirical or formal analysis should identify the relevant adaptive process.

The third boundary concerns emergence. A GRE claim that a relational configuration generates a new structure is broader than a complexity-science demonstration that specified local rules generate a macro-pattern. The latter has stronger mechanistic content within its model and should retain that precision after translation. Conversely, an emergent computational pattern does not establish the full historical, institutional, or normative meaning of the corresponding economic phenomenon.

The fourth boundary concerns non-equilibrium language. Some economic processes are appropriately studied through persistent adaptation and structural change, while others can be usefully approximated through equilibrium or comparative-static representations. GRE should therefore treat non-equilibrium analysis as a problem-dependent resource whose adequacy depends on the economic process being studied.

The fifth boundary concerns networks. Network representations can precisely en-

code particular relations and reveal topological effects. GRE's relational vocabulary includes forms of dependence, recognition, obligation, institutional authority, and historical connection that may not be encoded as edges. Translation should preserve the distinction between modeled topology and the broader relational configuration.

The sixth boundary concerns path dependence. GRE's historical orientation can easily become too permissive if every historical influence is called path dependence. Evolutionary and institutional research improves the framework by requiring mechanism-specific sequence dependence. Increasing returns, learning, complementarity, sunk investment, institutional reproduction, and network reinforcement are analytically distinguishable mechanisms.

The seventh boundary concerns complexity and criticality. Complex adaptive behavior, nonlinear feedback, network propagation, and emergent structure do not automatically imply criticality. Where GRE invokes near-critical dynamics, the relevant order parameters, timescales, transition structure, or empirical signatures should be specified at the level justified by the application.

The eighth boundary concerns normativity. Evolutionary survival, competitive success, robustness, adaptability, and emergent stability are descriptive properties. They do not establish justice, welfare, legitimacy, sustainability, or generative desirability. A highly adaptive system may reproduce concentrated power or ecological depletion; a stable network may sustain exclusion; an innovative trajectory may generate valuable capabilities while imposing costs elsewhere. Normative evaluation therefore requires additional criteria.

Proposition 21.366 (Evolutionary–complexity translation boundary). *Relational translation preserves explanatory content only when the specific evolutionary mechanism, interaction architecture, adaptive process, emergent pattern, network representation, historical sequence, and evidential warrant remain identifiable after translation into GRE vocabulary.*

A final boundary concerns ontological inference. Complexity models can reveal that relatively simple specified mechanisms generate rich system behavior, and evolutionary models can reveal how populations and routines change through history. These analytical successes do not establish that the ultimate ontology of economic reality is computational, network-theoretic, evolutionary, or relational in one exclusive sense. GRE's ontological suspension therefore remains active. Formalisms are selected because they illuminate particular economic structures and processes, while their success supports analytical adequacy within a stated domain and leaves ultimate ontology suspended.

The dialogue is consequently reciprocal. Evolutionary and complexity economics offer GRE unusually developed resources for modeling endogenous novelty, adaptation, interaction, sequence dependence, networks, and multi-level pattern formation. GRE can connect these mechanisms to heterogeneous value, power, conversion, epistemic access, and the distribution of future-generating capacities. The intellectual gain lies in preserving enough distinction for the traditions to correct one another while their specific mechanisms remain identifiable within the common vocabulary.

21.19 Feminist and Care Economics

This section extends the theory-specific dialogue to feminist and care economics. Its role is to examine economic approaches that place care, dependency, social reproduction, household relations, unpaid labor, embodiment, gendered institutions, and recognition within the field of economic explanation. The objective is comparative and interpretive rather than synthetic. Feminist economics contains heterogeneous theoretical lineages, including analyses of social provisioning, household power, labor-market inequality, social reproduction, national accounting, care work, and the epistemic effects of gendered categories. Care economics overlaps with these lineages while giving particular attention to the production, allocation, valuation, and institutional organization of caring activity. The discussion proceeds through care, dependency, social reproduction, household relations, unpaid labor, embodiment, and recognition, then develops a GRE relational reconstruction and identifies limits of translation. Table 21.19 summarizes the principal dialogue coordinates.

Definition 21.367 (Feminist–care economic configuration). *A feminist–care economic configuration* is an analytically specified arrangement of persons, households, care relations, paid and unpaid work, institutions, material resources, social norms, embodied needs, and distributions of responsibility whose interaction shapes both present provisioning and the reproduction of future economic capacities.

The definition supplies a common relational coordinate without reducing feminist economics to care economics. Power’s social-provisioning formulation presents feminist economics as an approach attentive to paid and unpaid care, human well-being, power relations, ethical values, and intersecting social differences (Power 2004). Folbre analyzes caregiving and social reproduction through structures of constraint that distribute responsibilities and costs unevenly across gender, age, class, race, and national location (Folbre 1994; Folbre 2001). Tronto treats care as a politically organized human activity whose distribution cannot be understood solely as a private moral matter (Tronto 1993). These contributions share an effort to move economically consequential dependence, maintenance, and provisioning into the analytical foreground while retaining different normative and theoretical commitments.

Proposition 21.368 (Feminist–care reconstruction condition). *A relational reconstruction of feminist and care economics should preserve distinctions among caring activity, dependency relations, social reproduction, household organization, unpaid labor, embodied need, recognition, distribution, and power while identifying the institutions that connect them.*

21.19.1 Care

Care provides the first coordinate because economies depend on activities that sustain persons and the conditions under which persons can participate in social and economic life. Feeding, cleaning, accompanying, teaching, nursing, comforting, supervising, coordinating appointments, maintaining living environments, and supporting persons through illness, disability, infancy, aging, or temporary vulnerability can require time, skill, attention, emotional engagement, physical effort, material resources, and institutional coordination. These activities can occur within house-

Table 21.19: Relational coordinates for feminist and care economics

Coordinate	Feminist-care analytical object	Dialogue boundary
Care	Activities and relations that maintain persons, capabilities, environments, and conditions of daily life	Identification of care with affection, femininity, or one institutional location
Dependency	Unequal or changing reliance on others for bodily, material, social, or institutional support	Treatment of dependency as exceptional deficiency or as a single undifferentiated condition
Social reproduction	Processes that sustain and renew persons, labor capacities, households, communities, and enabling institutions	Reduction of reproduction to household labor alone or identification of every maintenance process with one Marxian mechanism
Household relations	Internal allocations, responsibilities, authority, bargaining positions, obligations, and transfers	Representation of the household as a unitary actor where internal distribution is analytically consequential
Unpaid labor	Economically consequential work performed outside direct wage payment and often outside standard accounts	Equation of absence from market price with absence of value, or equation of monetary imputation with complete valuation
Embodiment	Material, temporal, life-course, and vulnerability conditions of economic subjects	Biological essentialism or treatment of bodily conditions as analytically irrelevant to economic organization
Recognition	Social and institutional visibility, standing, interpretation, and acknowledgment of persons and contributions	Substitution of recognition for redistribution, material provisioning, or institutional reform
Relational reconstruction	Interdependent provisioning architectures linking households, markets, states, communities, and infrastructures	Absorption of gendered and feminist analysis into generic relational vocabulary
Translation limit	Normative, experiential, political, and historically gendered remainders that resist full GRE translation	Identity inferred from shared attention to interdependence, power, reproduction, or relationality

holds, markets, public services, communities, cooperatives, and mixed institutional arrangements.

Definition 21.369 (Economically consequential care). *Economically consequential care* is activity or organized support directed toward maintaining, restoring, or developing the functioning, capabilities, bodily condition, relational participation, or everyday living conditions of persons whose realization depends partly on the attention or action of others.

Tronto's political account of care emphasizes that care is a broad human activity

and that its organization is structured by distributions of responsibility, privilege, and power (Tronto 1993). Held likewise develops care as a relational normative orientation that extends beyond intimate life to political, market, and global domains (Held 2006). England's review of care-work theories shows that care can be both paid and unpaid and that its economic organization raises distinct questions concerning devaluation, public-good characteristics, emotional attachment, and commodification (England 2005). Care therefore cannot be located analytically in a single sector.

The economic object also exceeds the observable task. A thirty-minute visit can involve travel, anticipatory planning, knowledge of another person's needs, responsibility for contingencies, and coordination with other caregivers or institutions. Conversely, time spent in proximity does not by itself establish that adequate care occurred. Analysis therefore benefits from distinguishing the measurable inputs of care from the relational quality and consequences of the caring process.

Proposition 21.370 (Care-organization condition). *An economic analysis of care should identify who requires support, who provides it, through which institutional arrangement, with what resources and authority, over what time horizon, and with what consequences for both recipients and providers.*

This condition makes distribution central. A household may meet a care need while concentrating time costs and foregone opportunities on one member. A market may expand paid care while reproducing low wages or insecure employment among care workers. A public programme may reduce household burdens while creating administrative conditions that affect access. The same care outcome can therefore be embedded in markedly different distributions of cost, risk, autonomy, and future capability.

GRE can translate these questions into relational-generative terms by examining how care changes future possibilities. Adequate care can preserve health, develop capabilities, sustain participation, support learning, and stabilize relations. Care deficits can propagate into later constraints. The translation should remain cautious: care is not valuable only because it produces later economic capacity. The care-economics literature also raises claims about dignity, need, obligation, and the quality of relations whose normative standing cannot be exhausted by downstream productivity.

21.19.2 Dependency

Dependency provides the second coordinate because economic subjects are situated within changing relations of reliance throughout the life course. Infancy, illness, disability, aging, injury, pregnancy, unemployment, migration, and institutional exclusion can intensify reliance on others, while ordinary adult life also depends on infrastructures, organizations, ecological systems, public services, and accumulated social knowledge. Feminist analyses of dependency challenge economic representations that take practical independence as the unexamined baseline of agency.

Definition 21.371 (Dependency relation). *A dependency relation is a structured condition in which a person's relevant functioning or participation relies materially on the continuing action, resources, access, or institutional support of another person or configuration, with the form and intensity of that reliance varying across domains*

and time.

Kittay places dependency and dependency work at the center of an account of equality, emphasizing that persons who provide intensive support to dependents can themselves become dependent on wider social cooperation and resources (Kittay 1999). Fineman similarly critiques the autonomous, self-sufficient subject by emphasizing pervasive interdependence and the institutional organization of caretaking responsibilities (Fineman 2004). These approaches make it possible to study dependency as part of social organization rather than as an exceptional departure from a fully independent economic actor.

Dependency is heterogeneous. A person may be financially independent while requiring assistance with mobility. A caregiver may possess professional expertise while depending economically on a household member because care time limits paid employment. A worker may appear individually autonomous while relying on public transport, healthcare, childcare, legal enforcement, and digital infrastructure. Different dependencies can therefore overlap without having identical causes or normative meanings.

Proposition 21.372 (Dependency-distribution condition). *The economic significance of dependency depends on both the underlying need or reliance and the institutional distribution of responsibility, resources, voice, risk, and exit possibilities through which that reliance is managed.*

This distinction prevents dependency from becoming a synonym for weakness. Some dependencies are constitutive of valuable cooperation; others become sources of domination when one party controls essential resources or when alternatives are inaccessible. GRE's power framework can help describe how asymmetry within a dependency relation modifies admissible actions, bargaining positions, and future alternatives. Feminist analysis adds an important warning: a formal option to exit may have little practical significance when bodily needs, caring obligations, social norms, immigration status, housing, or income make exit prohibitively costly.

Dependency also introduces time. Needs vary across the life course, and today's allocation of care can influence tomorrow's capabilities. The economic architecture therefore has to represent transitions among receiving care, providing care, and participating in other forms of production and social life. Such transitions are especially important for evaluating institutions that distribute the temporal burden of dependency unevenly across persons or generations.

21.19.3 Social Reproduction

Social reproduction provides the third coordinate because economic activity relies on processes that sustain and renew persons, labor capacities, households, communities, and institutional conditions across time. Feminist political economy has used the concept to connect activities frequently treated as external to production with the reproduction of the capacities and social relations on which production itself depends.

Definition 21.373 (Social reproduction). *Social reproduction* denotes the historically organized processes through which persons, embodied capacities, everyday life, gen-

erational continuity, and relevant social relations are maintained or renewed across time, including processes situated inside and outside markets.

Benería's analysis links production, reproduction, and the sexual division of labor, showing how the organization of reproductive activity participates in wider economic structures (Benería 1979). Vogel develops a social-reproduction account centered on the reproduction of labor-power and the social organization of domestic and generational processes within capitalism (Vogel 1983). Fraser later broadens the analysis by treating social reproduction as one of the background conditions on which capitalist accumulation depends and which accumulation can destabilize (Fraser 2014). These formulations overlap while differing in theoretical scope and mechanism.

The concept therefore requires specification. Reproduction of labor-power, reproduction of a household, generational replacement, maintenance of social norms, preservation of institutional capacities, and reproduction of an unequal social relation are distinct processes. Treating them as one mechanism would obscure the causal pathways that connect them. The analytical task is to identify what is being reproduced, by whom, through which practices and institutions, and with what changes across successive periods.

Proposition 21.374 (Reproduction-object condition). *A social-reproduction explanation should specify the persons, capacities, relations, institutions, or conditions being reproduced and the mechanisms through which their continuity or transformation occurs.*

This condition also leaves room for change. Reproduction rarely means exact duplication. Children acquire capabilities different from those of prior generations; care institutions change; gender norms shift; technologies reconfigure household work; migration reorganizes transnational care responsibilities; public services alter the boundary between household and collective provisioning. Social reproduction can therefore be simultaneously preservative and transformative.

GRE can connect social reproduction to generativity by asking which reproduced conditions make later action possible and which reproduce constraints. A childcare system can reproduce the daily conditions of employment while also shaping children's capabilities, caregivers' careers, gendered divisions of labor, public budgets, and future labor-market structures. The generative extension should preserve the source concept's attention to historical social relations rather than replacing social reproduction with a general statement that the future depends on the present.

21.19.4 Household Relations

Household relations provide the fourth coordinate because many economic decisions are organized through units whose internal distributions cannot always be represented adequately by a single preference ordering, budget, or objective. Households pool some resources, specialize activities, share risks, transfer income across persons and generations, provide care, and negotiate responsibilities. Internal authority and bargaining conditions can therefore affect both aggregate household outcomes and the distribution of well-being among members.

Definition 21.375 (Household relational architecture). *A household relational archi-*

texture is the configuration of resource access, responsibilities, decision procedures, obligations, information, authority, care relations, and exit possibilities through which household members coordinate provisioning and distribute its consequences.

Folbre's account of gender and the structures of constraint provides a useful bridge between individual action and household or institutional context, emphasizing that reproductive responsibilities and caring commitments are organized within intersecting structures rather than generated by unconstrained choice alone (Folbre 1994). Feminist economics more broadly has made the internal household distribution of resources and work analytically visible, thereby challenging representations in which household-level income or consumption automatically describes each member's access and welfare.

A relational account distinguishes pooling from equality. Two members may draw on a joint income while exercising different control over spending. A household may specialize efficiently in a narrow sense while one member accumulates less income, pension entitlement, professional experience, or bargaining power. Informal norms can shape who is expected to interrupt employment when care needs arise. Household organization thus links present allocation to later capabilities and outside options.

Proposition 21.376 (Household-disaggregation condition). *Household-level aggregates should be disaggregated whenever internal differences in resource access, authority, care responsibility, exposure to risk, or future opportunity materially affect the question under study.*

Disaggregation does not require treating cooperation as disguised conflict. Households can contain affection, reciprocity, shared commitments, and genuine common projects alongside unequal bargaining positions. The relevant economic question concerns how these relational forms coexist and how institutions influence them. Tax systems, parental leave, childcare services, inheritance rules, property regimes, labor-market conditions, housing, and immigration law can alter the resources and alternatives available to different members.

GRE's relational vocabulary is compatible with this analysis because the household can be represented as a history-bearing configuration rather than a point actor. The contribution of feminist economics is more specific: it provides reasons to ask which relations and inequalities disappear when household boundaries are used as the unit of observation. Relational reconstruction should therefore preserve the possibility that an aggregate improvement for a household coexists with deterioration for a particular member.

21.19.5 Unpaid Labor

Unpaid labor provides the fifth coordinate because the boundary of measured economic activity can exclude work that is materially necessary to daily life and social reproduction. Cooking, cleaning, childcare, eldercare, household administration, subsistence activity, and community support can consume substantial time and produce consequences for health, capabilities, paid employment, and institutional demand even when no wage is paid.

Definition 21.377 (Unpaid economic labor). *Unpaid economic labor* is purposive activity that contributes materially to provisioning, maintenance, care, reproduction, or collective functioning without direct wage payment for the activity itself.

Waring's critique of national accounting made the exclusion or marginalization of women's unpaid work a central problem of economic visibility and valuation (Waring 1988). Himmelweit's analysis adds conceptual caution by examining the consequences of extending a wage-labor-derived category of "work" to unpaid domestic activity (Himmelweit 1995). The two contributions together support a distinction between making economically consequential activity visible and assuming that one inherited category captures its full social meaning.

Measurement can proceed through time-use data, replacement-cost estimates, opportunity-cost estimates, satellite accounts, or direct measures of outputs and outcomes. Each representation answers a different question. Assigning a market-equivalent price to an hour of unpaid care can illuminate the scale of omitted activity, yet monetary imputation does not establish that paid and unpaid care are institutionally or relationally identical. Likewise, time measurement records duration but may miss intensity, responsibility, simultaneity, emotional demand, or interrupted availability.

Proposition 21.378 (Measurement-valuation distinction). *Making unpaid labor measurable and assigning it a monetary equivalent are distinct analytical operations; neither operation by itself supplies a complete account of the activity's value, quality, distribution, or relational meaning.*

This distinction is important for GRE's heterogeneous-value framework. Unpaid care can generate health, trust, knowledge, capability, continuity, and relational value while also imposing opportunity costs and reproducing inequality. Some effects are partially commensurable in monetary terms; others may remain heterogeneous. Analysis should therefore record multiple consequences rather than forcing them into one scalar measure.

The distribution of unpaid labor also links measurement to power. A policy that assumes unpaid family provision may shift public costs into households, where the burden can fall disproportionately on persons with weaker labor-market attachment or stronger social obligations. Conversely, public services, cash transfers, leave entitlements, or workplace flexibility can redistribute time and risk in different ways. The object of analysis is therefore both the quantity of unpaid work and the institutional architecture that generates its distribution.

21.19.6 Embodiment

Embodiment provides the sixth coordinate because economic subjects act through bodies with needs, capacities, vulnerabilities, rhythms, and life-course changes. Care and dependency make these conditions especially visible, yet embodiment also matters for work, mobility, fatigue, pregnancy, illness, disability, aging, exposure to hazards, and access to spaces or technologies. A relational economics that treats subjects only as abstract decision nodes can therefore miss constraints and capacities that arise through embodied conditions.

Definition 21.379 (Embodied economic condition). An *embodied economic condition* is a materially situated bodily capacity, need, vulnerability, rhythm, or life-course state that changes a person's feasible activities, support requirements, exposure to risk, or participation in economic relations.

Kittay's work on dependency demonstrates the analytical importance of bodily conditions that require sustained support and of the consequences for those who provide such support (Kittay 1999). Care-economics research similarly shows that the organization of care cannot be understood solely through preferences and prices because the timing, continuity, and responsiveness of support are connected to embodied need (England 2005). Embodiment thus supplies a material constraint on institutional substitutability: some forms of support can be delayed, standardized, or automated more readily than others.

Embodiment should be represented without biological essentialism. Bodily differences acquire economic meaning through social and institutional arrangements. Pregnancy has material characteristics, but its employment consequences depend on workplace design, leave policy, healthcare access, discrimination, household organization, and income support. Disability can interact with architecture, transport, communication standards, assistive technologies, and legal rights. The economic effect therefore emerges through relations between bodily conditions and environments.

Proposition 21.380 (Embodiment-environment coupling). *The economic consequences of an embodied condition should be analyzed through its interaction with material environments, technologies, institutions, social expectations, and available support rather than inferred from bodily difference alone.*

This proposition fits GRE's distinction between properties and relationally generated states. A capacity limitation can be intensified or reduced by a surrounding configuration. Embodiment also introduces temporal non-substitutability: care required at a specific moment may lose value if supplied later, and recovery or development may depend on sequences of support. Such timing effects connect care economics to GRE's analysis of generative spacetime while preserving the empirical specificity of embodied needs.

21.19.7 Recognition

Recognition provides the seventh coordinate because economic contribution, need, standing, and identity are mediated through social and institutional classifications. Care work can be materially necessary while remaining symbolically devalued. Unpaid labor can be absent from headline economic accounts. Persons can possess formal rights while encountering institutional categories that misdescribe their needs or contributions. Recognition therefore concerns more than interpersonal appreciation; it can shape economic visibility, access, status, and participation.

Definition 21.381 (Economic recognition relation). An *economic recognition relation* is a socially or institutionally organized mode of identifying, interpreting, acknowledging, or assigning standing to persons, needs, activities, or contributions in ways that can affect participation, valuation, resource access, or authority.

Fraser and Honneth's debate distinguishes and connects recognition and redistri-

bution while developing different accounts of their normative relation (Fraser and Honneth 2003). Feminist economics provides concrete economic settings in which such distinctions matter. National accounts can omit unpaid activity; occupational classifications can undervalue relational skill; administrative rules can recognize one family form while making another difficult to represent; and care recipients can be treated as passive costs rather than participants with preferences and agency.

Recognition is therefore connected to manifestation. What institutions count, name, record, and classify can affect what becomes visible to policy and what remains difficult to claim. Waring's critique of accounting illustrates this interface directly: statistical boundaries participate in the public representation of economic contribution (Waring 1988). GRE can analyze these classifications as manifestational structures with causal consequences, while feminist analysis supplies historically specific accounts of whose activities and needs have been obscured or devalued.

Proposition 21.382 (Recognition-redistribution distinction). *Improved recognition can change visibility, status, interpretation, and participation, but its distributive consequences depend on the institutions connecting recognition to resources, rights, authority, and material support.*

This proposition guards against symbolic substitution. Celebrating caregivers does not by itself provide income, respite, healthcare, pension rights, or workplace flexibility. Conversely, a transfer programme can improve material conditions while retaining stigmatizing classifications. Economic analysis therefore benefits from tracing the interfaces among recognition, redistribution, representation, and institutional participation.

Recognition also raises a reflexive question for GRE. The framework's own categories determine which relations become analytically visible. If care is translated only into "generative capacity," its immediate moral, affective, bodily, or political content may disappear. A responsible translation should preserve the source tradition's categories when they carry distinctions that GRE's general vocabulary would otherwise flatten.

21.19.8 Relational Reconstruction

The preceding coordinates support a relational reconstruction centered on provisioning architectures that connect embodied persons, dependency relations, households, markets, public institutions, communities, infrastructures, and intergenerational processes. Feminist and care economics already provide strongly relational analyses in many of these domains. GRE's contribution is therefore primarily integrative: it can connect care and social reproduction to heterogeneous value, history-bearing configurations, power, conversion interfaces, epistemic representation, and open future formation while preserving feminist economics' specific analyses of gendered organization and inequality.

Definition 21.383 (Care-centered relational reconstruction). *A care-centered relational reconstruction represents economic provisioning as a history-bearing configuration in which embodied needs, caring activities, dependencies, resources, institutions, norms, and distributions of responsibility jointly shape present functioning and future capabilities.*

The reconstruction begins by replacing the isolated economic subject with a situated participant whose practical agency can depend on care, infrastructure, rights, and prior social reproduction. This move does not eliminate individual agency. It identifies some of the conditions through which agency becomes exercisable. A person's feasible participation in education or employment may depend on childcare, accessible transport, health support, household time allocation, legal status, and the availability of other caregivers.

Second, the reconstruction treats provisioning as multi-institutional. Households, firms, markets, welfare states, schools, hospitals, community organizations, and digital platforms can substitute for, complement, or shift burdens onto one another. A reduction in public eldercare expenditure may increase household care time, affect labor supply, alter intergenerational transfers, and intensify dependence on migrant care workers. The relevant unit of analysis is therefore the coupled architecture rather than a single sector.

Proposition 21.384 (Provisioning-interface condition). *A relational analysis of care should trace how changes at the interfaces among households, markets, public institutions, communities, and infrastructures redistribute time, cost, risk, authority, and future capability.*

Third, heterogeneous value becomes important because care can carry several forms of consequence simultaneously. It can preserve bodily functioning, support emotional security, enable paid employment, transmit knowledge, sustain relationships, and reduce or intensify future dependency. These consequences need not share one metric. A low-cost arrangement can be poor in continuity or dignity; a time-intensive arrangement can generate substantial relational and developmental value while constraining a caregiver's future options. Evaluation therefore requires explicit treatment of whose value and whose future possibilities are being considered.

Proposition 21.385 (Care-generativity distinction). *Care can have generative consequences by preserving or expanding future capabilities and relations, while the value and normative significance of care also include present needs and relational qualities that should not be reduced to later generativity.*

Fourth, power enters through the allocation of dependency responsibilities and control over essential resources. A person who controls income, housing, legal status, information, or access to services may shape another person's practical alternatives. Institutional rules can also distribute unpaid responsibilities without an explicit bilateral command. GRE's power vocabulary can represent these asymmetries, while feminist economics contributes historically grounded accounts of how gendered norms and institutions organize them.

Fifth, epistemic representation becomes part of the economic architecture. Time-use surveys, national accounts, eligibility categories, care-quality metrics, household statistics, and labor classifications make some aspects of provisioning visible and leave others weakly represented. Measurement can influence funding, recognition, and policy. The relation between manifestational representation and material provisioning is therefore recursive: what becomes legible can affect what institutions subsequently support.

Proposition 21.386 (Care-system generative assessment). *A generative assessment of a care system should examine present adequacy together with the distribution of future capabilities, caregiver sustainability, dependency risks, institutional resilience, and the reproduction or transformation of unequal relations.*

Such assessment is especially relevant when short-run efficiency and long-run reproduction diverge. Understaffing can lower immediate expenditure while increasing burnout and turnover. Reliance on unpaid household care can reduce public budgets while narrowing caregivers' later income and pension entitlements. Intensive early support can require substantial present resources while changing later health or educational trajectories. The generative lens thus extends the time horizon without displacing the immediate adequacy of care.

21.19.9 Limits of Translation

The translation between feminist and care economics and GRE is substantial because both attend to relations, interdependence, power, history, heterogeneous value, and the conditions through which economic agency is sustained. These shared coordinates create opportunities for dialogue, yet they do not establish theoretical identity. Feminist economics contains substantive historical, political, normative, methodological, and experiential commitments that a general relational framework cannot inherit merely by adopting similar vocabulary.

Definition 21.387 (Feminist–care translation remainder). *A feminist–care translation remainder* is a concept, normative commitment, historical diagnosis, experiential distinction, political category, or empirical mechanism whose analytical role is weakened or altered when translated into GRE's more general relational vocabulary.

Gender provides the first major remainder. GRE can represent asymmetrical relations, constraints, norms, classifications, and differential generative capacities, but these general categories do not explain the historically specific organization of gender. Feminist economic analysis contributes empirical and theoretical accounts of gendered divisions of labor, occupational valuation, household responsibility, property, care expectations, and institutional design. Replacing those categories with generic asymmetry would lose explanatory content.

Care provides a second remainder. GRE can analyze care as a relation with generative effects, yet care ethics and care economics also examine attentiveness, responsibility, responsiveness, dependency, dignity, and the quality of caring relations (Tronto 1993; Held 2006). These dimensions cannot be derived automatically from a formal account of relational persistence or future possibility.

Social reproduction provides a third remainder. The concept can be translated partly into the reproduction of capacities and enabling relations, but specific social-reproduction theories connect those processes to historically defined modes of production, gender relations, households, labor-power, and institutional crisis (Vogel 1983; Fraser 2014). A generic reproduction operator would preserve too little of that theoretical architecture.

Proposition 21.388 (Specificity-preservation condition). *GRE translation is adequate only when it preserves the historically and politically specific categories that carry*

causal or normative content in feminist and care-economic explanations.

A fourth remainder concerns standpoint and experience. Some feminist scholarship asks how social position affects what becomes observable, credible, or conceptually available. GRE's epistemic framework can represent situated access and manifestational difference, but it should not presume that a general formal vocabulary reproduces the methodological and political work of feminist epistemology. Direct empirical engagement with lived conditions remains necessary.

A fifth remainder concerns normative judgment. Feminist and care economics frequently address justice, equality, dignity, need, autonomy, recognition, and responsibility. GRE can map distributions and generative consequences, but relational description alone does not settle how caring responsibilities should be allocated or which inequalities are justified. Normative conclusions require additional argument.

Proposition 21.389 (Relational non-identity of feminist economics). *Shared emphasis on interdependence and relational structure does not make feminist economics a special case of GRE or GRE a substitute for feminist economic analysis.*

The domain of adequacy is therefore complementary. Feminist and care economics are especially strong where economic explanation requires visibility of care, dependency, household power, unpaid labor, social reproduction, embodiment, gendered institutions, and the normative organization of provisioning. GRE can contribute a broader architecture for tracing how these relations interact with heterogeneous value, power, temporal dynamics, epistemic representation, and future possibility. The dialogue is productive when both directions remain open: feminist economics can enrich and correct GRE's account of relational economic life, while GRE can offer additional coordinates for connecting care and reproduction to other domains of economic change.

Proposition 21.390 (Feminist–care dialogue condition). *The strongest dialogue preserves feminist and care economics as sources of independent theoretical and empirical correction while using GRE to examine cross-domain relations, temporal propagation, heterogeneous value, and generative consequences that extend beyond any single provisioning institution.*

21.20 Capability and Human Development Approaches

This section extends the theory-specific dialogue to the capability approach and human-development research. Its role is to examine an evaluative tradition that shifts economic attention from resources, income, utility, and commodity possession toward what persons are effectively able to do and be. It also preserves distinctions among achievement, opportunity, agency, freedom, and institutional conditions. The objective is comparative and reconstructive. The discussion first develops functionings, capabilities, conversion factors, agency, freedom, and heterogeneity; it then offers a GRE relational reconstruction, identifies a generative extension concerned with the production and transformation of future capabilities, and closes by specifying limits of translation. The method is interpretive and conceptual, with attention to the differences among Sen's relatively open capability framework, Nussbaum's more substantively specified account, operational work in poverty and

human-development analysis, and GRE's own relational vocabulary. Table 21.20 summarizes the principal dialogue coordinates.

Definition 21.391 (Capability–human-development configuration). A *capability–human-development configuration* is an analytically specified arrangement of persons, resources, personal characteristics, social institutions, environmental conditions, relations, and conversion processes that shapes achieved functionings, substantive opportunities, agency, and the practical freedoms available to persons or groups.

Sen's capability approach develops a space of evaluation centered on functionings and capabilities rather than commodity possession or utility alone (Sen 1985; Sen 1992). In *Development as Freedom*, this orientation is connected to development as an expansion of substantive freedoms and to the institutional conditions through which such freedoms become effective (Sen 1999). The human-development tradition institutionalized a related shift by treating development as an enlargement of people's choices and capabilities beyond income growth or aggregate production alone (United Nations Development Programme 1990). Nussbaum develops a distinct capability formulation organized around central human capabilities and threshold political principles, while Robeyns reconstructs the approach as a broader interdisciplinary framework with explicit attention to conversion factors and human diversity (Nussbaum 2000; Robeyns 2005).

Proposition 21.392 (Capability reconstruction condition). A *relational reconstruction of capability and human-development approaches* should preserve distinctions among resources, conversion conditions, achieved functionings, capability sets, agency, freedom, valuation, and institutional context while identifying the relations through which these elements affect one another.

21.20.1 Functionings

Functionings provide the first coordinate because the capability approach evaluates important dimensions of life in terms of what persons actually manage to be and do. Functionings can include being adequately nourished, being sheltered, moving through one's environment, participating in social life, learning, caring for others, working under acceptable conditions, exercising political voice, or maintaining self-respect. Their analytical significance lies in achieved states and activities rather than the mere possession of inputs from which those achievements might be produced.

Definition 21.393 (Functioning). A *functioning* is an achieved being or doing of a person that is treated as relevant within a specified evaluative context.

Sen's formulation distinguishes commodities and their characteristics from the functionings persons achieve through them (Sen 1985). A bicycle, for example, may possess transport-relevant characteristics, yet the functioning of mobility depends on whether a person can use it, whether roads or other infrastructures permit its use, whether social rules allow that use, and whether the person's bodily condition is compatible with it. The distinction creates analytical space between possession and achievement.

The same structure applies beyond material commodities. School enrollment differs from learning; healthcare access differs from restored or preserved health; legal

Table 21.20: Relational coordinates for capability and human-development approaches

Coordinate	Capability–human-development analytical object	Dialogue boundary
Functionings	Achieved beings and doings that constitute dimensions of a person's life	Identification of achievement with resources, utility, or one externally chosen outcome metric
Capabilities	Substantive opportunities to achieve valued combinations of functionings	Equation of formal permission, nominal choice, or resource ownership with effective opportunity
Conversion factors	Personal, social, institutional, relational, and environmental conditions mediating resource-to-functioning conversion	Treatment of resource possession as sufficient evidence of equivalent opportunity
Agency	Capacity to pursue goals and commitments that a person has reason to value, including concerns extending beyond personal well-being	Reduction of agency to preference satisfaction or individual welfare achievement
Freedom	Effective opportunity and relevant process conditions through which persons can pursue valued ways of living	Identification of freedom with an unweighted count of nominal options
Heterogeneity	Differences in bodies, needs, environments, relations, institutions, responsibilities, and conversion conditions	Use of one resource or achievement threshold as if equivalent across heterogeneous persons and contexts
Relational reconstruction	Coupled architecture through which institutions and relations shape conversion, opportunity, agency, and achievement	Absorption of capability evaluation into generic relational description without preserving its evaluative distinctions
Generative extension	Transformation of future capability spaces through present action, institutions, learning, care, infrastructure, and constraint	Attribution of GRE's temporal-generative claims to the capability approach without separate argument
Translation limit	Normative selection, informational incompleteness, measurement, agency, and theory-specific remainders	Identity inferred from shared concern with possibility, freedom, human diversity, or enabling conditions

political rights differ from effective participation; internet connectivity differs from the ability to acquire reliable information. In each case, an input or institutional entitlement participates in an achievement process whose outcome depends on additional conditions.

Proposition 21.394 (Functioning-specification condition). *A functioning-based anal-*

ysis should specify the achieved being or doing under evaluation, the relevant person or population, the temporal and institutional context, and the evidence through which the achievement is identified.

This condition matters because functionings can be described at different levels of abstraction. “Being healthy” can conceal heterogeneous dimensions of bodily functioning, pain, mobility, mental condition, chronic illness, or access to continuing treatment. “Participating in society” can include political voice, employment, community association, digital access, family participation, or cultural belonging. Analytical precision therefore requires a locally adequate description rather than a single universal granularity.

Functionings also introduce a distinction between achievement and the evaluative meaning of achievement. Two persons may exhibit the same observable state while arriving there through different opportunity structures. Fasting and involuntary hunger can produce superficially similar nutritional outcomes while differing sharply in available alternatives. A long working week can reflect valued professional commitment or severe economic constraint. Functioning evidence is therefore important while remaining incomplete for judgments about freedom.

GRE can translate achieved functionings into relational states produced through interacting resources, capacities, institutions, and relations. Such translation is useful for tracing the conditions of achievement, yet the capability approach contributes an evaluative discipline that asks whether the achieved states themselves belong in the relevant informational space. Relational explanation and capability evaluation consequently remain connected but distinguishable tasks.

21.20.2 Capabilities

Capabilities provide the second coordinate because the approach is concerned with substantive opportunities as well as achieved outcomes. A person who reaches a valued functioning through one constrained path can occupy a different evaluative position from a person who reaches the same functioning while retaining meaningful alternatives. Capability analysis therefore brings feasible ways of living into the evaluative space.

Definition 21.395 (Capability). A *capability* is a substantive opportunity to achieve a functioning or combination of functionings that is relevant within the evaluative problem under consideration.

Sen develops capability as freedom to achieve alternative functioning combinations rather than as a stock of resources or an achieved functioning alone (Sen 1985; Sen 1992). This distinction gives the approach a counterfactual component: evaluation concerns what a person could effectively achieve under the relevant conditions, including alternatives that may remain unrealized. The capability set is therefore richer than a record of observed outcomes.

The adjective “substantive” is important. Formal permission can exist while practical opportunity remains narrow. A person may be legally permitted to attend university while lacking prior education, income, transport, disability accommodation, immigration documentation, or time free from care responsibilities. A worker may

be formally free to leave an employer while health insurance, visa status, housing, debt, or local labor-market conditions sharply limit effective exit. Capability analysis asks how these conditions affect what is genuinely feasible.

Proposition 21.396 (Substantive-opportunity condition). *An asserted capability requires evidence concerning effective feasibility under relevant personal, social, institutional, and environmental conditions rather than evidence of formal permission alone.*

Capability is also plural. Economic resources can support several functioning combinations, and the same resource bundle can generate different capability sets for different persons. This plurality complicates measurement. Some capabilities are difficult to observe because they are opportunities rather than realized states. Others depend on contingent institutional responses. Operational research therefore often combines functioning indicators, resource information, institutional evidence, and reasoned judgments about feasible alternatives rather than directly measuring an abstract capability set.

Alkire emphasizes both the practical value and the operational difficulty of capability-based poverty analysis, including the problem of selecting dimensions and evaluating plural freedoms without collapsing them into one metric (Alkire 2002). This difficulty is analytically productive: it exposes where an apparently simple welfare measure rests on choices about which opportunities count, whose valuation enters, and what evidence is sufficient.

GRE's notion of an option space is close enough to enable dialogue, yet equivalence should remain partial. A GRE option space can describe feasible future transitions of many kinds, including institutional or organizational possibilities. A capability set is specifically connected to persons' substantive opportunities and an evaluative concern with what they can be and do. Translating capability into generic possibility would therefore discard part of its normative and human-development role.

21.20.3 Conversion Factors

Conversion factors provide the third coordinate because resources acquire evaluative significance through the conditions that mediate their transformation into functionings and capabilities. The concept explains why equal resources can coexist with unequal substantive opportunities. Robeyns distinguishes personal, social, and environmental conversion factors as mediating conditions in the capability framework (Robeyns 2005).

Definition 21.397 (Conversion factor). A *conversion factor* is a personal, social, institutional, relational, or environmental condition that affects the extent or manner in which a resource, entitlement, service, or opportunity can be transformed into an achieved functioning or substantive capability.

Personal conversion factors can include bodily characteristics, health conditions, age, acquired skills, or literacy. Social and institutional factors can include laws, norms, discrimination, public-service design, family responsibilities, organizational procedures, language regimes, or administrative requirements. Environmental factors can include climate, geography, transportation networks, pollution, physical accessibility, and settlement structure. These categories are analytically useful while

their empirical boundaries can overlap.

Consider equal cash transfers. Their capability effects can differ because recipients face different housing costs, medical needs, mobility conditions, caregiving responsibilities, debt obligations, discrimination, public-service availability, or geographic access. The monetary transfer remains important, yet equality in the transfer does not establish equality in the capability generated from it. Similar reasoning applies to educational resources, healthcare, digital technologies, legal rights, and public infrastructure.

Proposition 21.398 (Conversion-tracing condition). *Capability analysis should trace the conditions connecting resources or entitlements to effective opportunities and achievements whenever variation in those conditions materially changes the evaluative conclusion.*

The conversion concept creates a strong interface with GRE. GRE already treats conversion among heterogeneous value forms as an object of analysis. A public subsidy may be converted into mobility, education, health, political participation, or relational access through institutionally structured pathways. Control over conversion interfaces can therefore affect who realizes a capability from a nominally shared resource.

The overlap has limits. Capability conversion concerns the relation between means and valuable beings or doings, while GRE's conversion vocabulary can also describe transformations among currencies, symbolic forms, institutional statuses, knowledge, ecological value, or organizational resources. GRE should consequently avoid treating capability conversion as a special case of every heterogeneous-value conversion. The direction of translation is most precise when the object is a person's effective opportunity or functioning.

Conversion factors also make policy comparison sensitive to institutional complementarity. Income support may have larger capability effects where healthcare, public transport, childcare, legal documentation, and accessible services are available. Drèze and Sen's analysis of development and public action emphasizes such complementarities among economic, social, and political institutions in expanding effective freedoms (Drèze and Sen 2002). Capability-oriented evaluation thus directs attention toward bundles of enabling conditions rather than isolated inputs.

21.20.4 Agency

Agency provides the fourth coordinate because capability approaches distinguish a person's ability to pursue goals and commitments from a narrower assessment of that person's own well-being. Persons can value family responsibilities, political causes, environmental protection, professional commitments, religious practice, community projects, scientific inquiry, or care for others even when these commitments impose personal costs. Sen's distinction between agency and well-being is therefore important for economic theories that otherwise represent action primarily through individual welfare or preference satisfaction (Sen 1992).

Definition 21.399 (Agency capability). An *agency capability* is a substantive opportunity for a person to pursue or participate in goals, commitments, or forms of action

that the person has reason to value, including goals extending beyond the person's own well-being achievement.

Agency has both individual and relational conditions. A person may possess knowledge and motivation while lacking legal standing, organizational access, political voice, social recognition, financial resources, or collaborators. Conversely, institutions can create agency by establishing participatory procedures, public information, legal rights, collective organizations, or accessible channels of contestation. Development conceived through freedom therefore concerns the conditions under which persons can act as participants rather than solely as recipients of benefits (Sen 1999; Drèze and Sen 2002).

Proposition 21.400 (Agency-enablement condition). *An analysis of agency should distinguish personal intention from the relational and institutional conditions that make valued action practically exercisable.*

This distinction matters for public policy. A programme can increase income while leaving beneficiaries with little voice over its design. A health intervention can improve outcomes while relying on highly paternalistic procedures. A development project can create infrastructure while weakening local organizational capacities. Capability and agency analysis asks whether persons gain substantive scope to shape relevant aspects of their lives and collective environments, although the appropriate weight of agency relative to other values remains a normative question.

GRE's concept of generative capacity creates a nearby but distinct coordinate. Generative capacity concerns the ability of a subject or configuration to produce changes, relations, structures, values, or future possibilities. Agency capability concerns a person's substantive opportunity to pursue valued goals. A powerful organization can possess substantial generative capacity without expanding the agency of affected persons. A person can possess ethically significant agency even when the scale of generated systemic change is small. Preserving this distinction prevents power to produce effects from becoming a substitute for freedom to act as an agent.

Agency is also distributed. Collective action frequently depends on organizations, norms, infrastructures, and coordinated roles. Capability analysis can therefore examine the conditions of collective or political participation without requiring an isolated individualist ontology. Robeyns emphasizes that ethical individualism in capability evaluation does not imply that social structures or relations are explanatorily irrelevant (Robeyns 2005). This point provides an important bridge to relational reconstruction.

21.20.5 Freedom

Freedom provides the fifth coordinate because the capability approach treats development and advantage partly through the substantive opportunities available to persons. Sen's development framework places expansion of substantive freedom at the center while also emphasizing the instrumental and constitutive roles of political freedoms, economic facilities, social opportunities, transparency guarantees, and protective security (Sen 1999). Freedom in this framework is therefore connected to both opportunity and enabling institutional arrangements.

Definition 21.401 (Substantive freedom). *Substantive freedom* is effective scope to pursue valued beings, doings, and forms of agency under conditions in which relevant opportunities are practically accessible rather than merely formally permitted.

Freedom is not adequately represented by the number of nominal options. Ten inaccessible options do not necessarily provide more substantive freedom than two practically realizable alternatives. Option quality, feasibility, information, cost, social meaning, risk, reversibility, and compatibility with other responsibilities can all affect the freedom represented by an opportunity set. Capability evaluation consequently requires more structure than option counting.

Proposition 21.402 (Freedom-quality condition). *Evaluation of substantive freedom should consider the feasibility, significance, accessibility, and relevant process conditions of available alternatives rather than the cardinality of nominal options alone.*

Freedom also interacts with achievement. An effective health capability can matter even when illness never occurs; political participation can matter even when a person chooses silence; mobility can matter even when a person chooses to remain nearby. Opportunity itself can therefore carry evaluative significance. At the same time, persistent failure to achieve basic functionings can indicate that nominally described opportunities are ineffective or that conversion conditions remain inadequate.

The relation between freedom and responsibility requires care. Expanded opportunity can enable agency, while responsibility for structural deprivation should not be transferred automatically onto individuals on the ground that options formally existed. A job seeker facing discrimination, inaccessible transport, or care obligations can have a very different substantive opportunity structure from another person with the same formal eligibility. Capability analysis keeps those background conditions within the evaluative frame.

GRE can contribute a temporal dimension by asking how present freedoms alter later option spaces. Education, legal status, health, savings, social networks, or political participation can expand future opportunities. Conversely, debt, incarceration, ecological damage, deskilling, prolonged unemployment, or exclusion can narrow later possibilities. This temporal extension is analytically compatible with the capability approach while remaining an additional GRE emphasis unless separately established within a capability formulation.

21.20.6 Heterogeneity

Heterogeneity provides the sixth coordinate because the capability approach takes human diversity seriously in evaluating resources and opportunities. Persons differ in bodily characteristics, health, age, household position, care obligations, social identities, skills, environments, institutional access, and exposure to discrimination. These differences can alter both needs and conversion possibilities. Sen's critique of resource-centered equality relies partly on the fact that equal resources can generate unequal freedom to achieve (Sen 1992).

Definition 21.403 (Capability-relevant heterogeneity). *Capability-relevant heterogeneity* is variation among persons or contexts that materially changes the conversion

of resources and institutions into functionings, capabilities, agency, or substantive freedom.

Heterogeneity is not a residual adjustment after a representative-person model. In many problems it determines the object of evaluation. Disability can change the resources required for mobility; pregnancy can change nutritional and healthcare needs; linguistic difference can alter access to public services; rural location can change the practical value of transport infrastructure; caregiving responsibility can alter the time available for education or employment. Capability analysis therefore resists assuming that a uniform input carries a uniform opportunity value.

Proposition 21.404 (Heterogeneity-relevance condition). *Differences among persons or contexts should enter capability evaluation when they materially alter needs, conversion processes, feasible alternatives, agency, or the meaning of achieved functionings.*

The recognition of heterogeneity also complicates aggregation. A population average can improve while a subgroup with distinctive conversion barriers experiences little change. A national increase in school enrollment can coexist with inaccessible education for disabled students or with gendered barriers to completion. Human-development analysis therefore benefits from disaggregation by relevant dimensions where evidence permits.

Nussbaum's capabilities approach adds a different response to heterogeneity by proposing central human capabilities and threshold requirements within a theory of basic political entitlements (Nussbaum 2000). Sen generally leaves the selection and weighting of capabilities more open to reasoned evaluation and public reasoning. These approaches share attention to human diversity while differing in the degree of substantive specification built into the framework.

Adaptive preferences create an additional evaluative difficulty. Persons living under persistent deprivation or restrictive social conditions may adjust aspirations to feasible surroundings. Nussbaum's analysis makes this issue particularly salient in relation to gender injustice (Nussbaum 2000). Capability evaluation therefore cannot infer adequate freedom solely from reported satisfaction. The response, however, requires epistemic humility: external analysts can also misidentify what persons value. Public reasoning, participatory inquiry, contextual evidence, and explicit normative argument remain important safeguards.

21.20.7 Relational Reconstruction

A GRE relational reconstruction begins from a strong point of contact: capability is already mediated by relations among persons, resources, institutions, infrastructures, environments, and social rules. The reconstruction therefore does not need to transform an isolated-resource theory into a relational one. Its task is to make the architecture of conversion and capability formation more explicit, especially where interdependence, institutional interfaces, power, and historical sequence shape effective opportunity.

Definition 21.405 (Relational capability architecture). *A relational capability architecture is the history-bearing configuration of resources, persons, institutions, infrastructures, social relations, conversion conditions, and power relations through which*

substantive opportunities and achieved functionings are enabled, constrained, distributed, and transformed.

The first reconstruction concerns resource relations. A person's command over a resource can depend on property rights, household allocation, market access, administrative eligibility, social recognition, or political membership. Sen's entitlement analysis already demonstrates that access to food cannot be inferred directly from aggregate availability because persons' command over resources depends on legally and economically structured entitlement relations (Sen 1981). The capability framework generalizes the evaluative concern from command over commodities to what such command permits persons to achieve.

Second, conversion factors can be represented as relational interfaces. A public transit system converts geographic location and monetary resources into mobility only through schedules, accessibility, safety, legal access, and network coverage. A university converts prior learning and financial support into educational opportunity through admissions rules, teaching practices, language systems, housing, assessment, and disability accommodation. These interfaces are institutional and relational rather than properties of the resource alone.

Proposition 21.406 (Relational-conversion condition). *A capability explanation should represent conversion as a relation among resources, persons, institutions, and environments whenever effective opportunity depends on their joint configuration.*

Third, power affects capability formation. Control over housing, documentation, wages, care, credit, information, or public authorization can change another person's effective options. Discrimination can reduce conversion from education to employment. Household authority can limit practical access to income that appears available at household level. Administrative discretion can determine whether a formal entitlement becomes an effective service. GRE's power vocabulary can help trace these mechanisms while capability analysis supplies the evaluative question of what happens to persons' substantive opportunities and agency.

Fourth, capabilities can be interdependent across persons. One person's mobility may depend on another person's unpaid care. A child's educational capability can depend on parental time, school quality, public transport, and neighborhood safety. A caregiver's employment capability can depend on accessible childcare. Such relations create distributions of capability in which expansion for one person can support, leave unchanged, or constrain another person's opportunities depending on institutional design.

Proposition 21.407 (Capability-interdependence condition). *Where one person's capability depends materially on another person's time, resources, authority, or institutional position, analysis should represent the coupled capability effects rather than evaluating each person as an isolated unit.*

Fifth, representation matters. Capability indicators, poverty thresholds, composite indices, surveys, administrative records, and qualitative accounts are manifestations of a richer opportunity structure. They can support evaluation without fully reproducing it. GRE's epistemic framework therefore treats capability measurement as an inverse problem: observed functionings and institutional conditions provide evidence about effective opportunity, while several underlying capability configurations

may remain compatible with the same observed outcome.

This reconstruction strengthens the connection between capability analysis and the book's wider economic architecture. Allocation affects capability through conversion relations; institutions organize conversion; power shapes access and agency; heterogeneous value affects which functionings matter; and historical trajectories shape the opportunity sets inherited by later persons. The reconstruction remains useful only if these additions preserve the capability approach's evaluative focus on what persons are effectively able to be and do.

21.20.8 Generative Extension

The generative extension asks how present capability configurations participate in producing future capabilities, constraints, relations, and institutional possibilities. Capability approaches already contain temporal concerns through education, health, participation, public action, and development. GRE adds a more explicit focus on the mechanisms through which capabilities become causes of later capability formation and on the possibility that institutions alter the rules governing those processes.

Definition 21.408 (Capability generativity). *Capability generativity* is the capacity of a present functioning, capability, relation, or institutional arrangement to contribute to the formation, preservation, transformation, or loss of future substantive opportunities for oneself or others.

Education provides a simple illustration. Literacy is an achieved functioning and can also expand later capabilities for employment, political participation, information access, further learning, and navigation of institutions. Health can preserve future work, care, mobility, and participation capabilities. Legal identity can enable later access to banking, education, healthcare, travel, and political rights. These effects are not uniform, and their pathways depend on institutions and relations.

Proposition 21.409 (Capability-propagation condition). *A generative capability analysis should identify the mechanism through which a present capability or functioning changes later opportunity structures, together with the persons, time horizon, and institutional conditions over which that effect is expected to operate.*

The extension also includes capability preservation. Some arrangements prevent the erosion of future opportunity rather than producing visibly new options. Preventive healthcare, social insurance, ecosystem protection, maintenance of public infrastructure, preservation of legal status, or continuing education can keep capability sets from contracting. Preservation is therefore generative in a broad temporal sense when it changes the future relative to a credible deterioration pathway.

Capability effects can propagate across persons and generations. Children's capabilities depend partly on adult care, education systems, public health, housing, and environmental conditions. Caregivers' opportunities can in turn depend on how those responsibilities are distributed. Infrastructure financed by one generation can expand or constrain the options of later generations. Generative assessment therefore benefits from tracing capability relations across time and across linked subjects.

Proposition 21.410 (Interpersonal capability propagation). *Capability-generative effects should be evaluated across affected persons when one person's opportunity ex-*

pansion or preservation depends on transfers of time, risk, resources, environmental burden, or institutional constraint to others.

The generative extension also distinguishes capability expansion from an increase in the sheer number of options. An institution can create many low-value or inaccessible alternatives while weakening basic security. Conversely, a regulation can remove harmful options while expanding meaningful freedom through safety or trust. The evaluative object remains substantive capability, so generativity should be assessed through the quality and distribution of future opportunity rather than option proliferation alone.

Proposition 21.411 (Generative-quality condition). *An increase in future options constitutes capability expansion only to the extent that it enlarges substantive opportunities relevant to the evaluative problem and does not rely on hidden capability losses that alter the conclusion.*

A further extension concerns institutional self-reinforcement. Expanded education and political participation can alter public expectations, organizational capacities, and demand for accountable institutions; improved health systems can generate professional knowledge and administrative capability; exclusion can reproduce distrust, low participation, and weak institutional access. These are hypotheses about recursive capability formation rather than consequences that follow automatically from the capability approach. They require historical and empirical investigation.

The human-development lineage provides a natural interface because it already treats health, education, income, participation, and public institutions as mutually relevant to people's possibilities (United Nations Development Programme 1990; Sen 1999). GRE's contribution is to make recursive generation, temporal propagation, and changes in the capability-generating architecture explicit research objects.

21.20.9 Limits of Translation

The translation between capability and human-development approaches and GRE is extensive because both attend to possibility, heterogeneous conditions, institutional mediation, agency, and the consequences of present arrangements for what can occur. The overlap nevertheless leaves important remainders. Capability analysis is an evaluative framework concerned with substantive human opportunities, while GRE is a broader relational-generative research programme whose objects also include institutions, organizations, ecological configurations, symbolic systems, and non-human relations. Shared language of capability or possibility does not establish theoretical identity.

Definition 21.412 (Capability translation remainder). *A capability translation remainder is an evaluative distinction, normative commitment, informational requirement, measurement problem, or theory-specific concept whose role is altered or weakened when translated into GRE's more general vocabulary of relations, capacities, constraints, and future possibilities.*

The first remainder concerns valuation. Capability approaches require judgments about which functionings and capabilities matter. Sen leaves substantial room for public reasoning and context-sensitive selection, while Nussbaum offers a more sub-

stantively specified list and threshold orientation (Sen 1992; Nussbaum 2000). GRE can represent heterogeneous value and competing evaluative regimes, but relational structure alone cannot select the capabilities that deserve priority. That choice requires normative and political argument.

The second remainder concerns the subject of evaluation. Capability approaches characteristically focus on persons and what they can effectively be and do. GRE can analyze capability-like properties of organizations or institutions, yet calling organizational adaptability a “capability” does not place it within the same evaluative space as human capability. The translation should therefore preserve the person-centered normative role of capability when capability literature is being reconstructed.

Proposition 21.413 (Person-centered translation condition). *GRE translation should preserve the person-centered evaluative role of capabilities where that role is constitutive of the source argument, even when broader relational analysis includes organizations, institutions, or ecological systems.*

The third remainder concerns agency. GRE can model generative capacity and power, yet these concepts do not determine whether a person enjoys agency freedom in Sen’s sense. Capacity to cause change can coexist with coercion, domination, or the inability to pursue goals one values. Conversely, agency can be meaningful even when systemic causal influence is limited. Translation therefore requires separate coordinates for causal efficacy and substantive agency.

The fourth remainder concerns measurement. Capabilities are partly counterfactual and can remain unobserved. Functioning data, stated preferences, resource measures, or administrative indicators provide incomplete evidence. Alkire’s operational work emphasizes the need for explicit dimension selection, valuation, and practical methods under informational constraints (Alkire 2002). GRE’s inverse-problem epistemology can describe this underdetermination, yet it does not by itself solve the empirical task of identifying feasible alternatives.

Proposition 21.414 (Capability-evidence condition). *A claim about substantive capability should state the evidential basis for inferred feasible alternatives and distinguish observed achievement from reconstructed opportunity wherever that distinction affects the argument.*

The fifth remainder concerns freedom’s normative status. GRE may treat future possibility as analytically important because option spaces affect resilience, agency, and generativity. Capability approaches additionally ask why particular human freedoms matter and how they should enter evaluation. An open future is not automatically a just or valuable future. Some possibilities involve domination, harm, or exclusion. Normative evaluation therefore remains indispensable.

The sixth remainder concerns incompleteness and pluralism. Capability frameworks often retain multidimensional informational spaces precisely because reduction to one scalar measure can hide important differences. Operational policy, however, frequently requires selection, thresholds, weights, or aggregation. Human-development indicators demonstrate both the practical value and the compression involved in measurement (United Nations Development Programme 1990). GRE’s heterogeneous-value framework can help keep the compression visible, but it cannot eliminate the need for accountable judgment when decisions require comparison.

Proposition 21.415 (Capability–GRE non-identity). *Shared attention to effective possibility, enabling conditions, heterogeneity, and freedom supports substantial dialogue between capability approaches and GRE while leaving distinct normative, informational, and person-centered commitments intact.*

The domain of adequacy is therefore complementary. Capability and human-development approaches are especially strong when the economic question concerns what persons are effectively able to achieve, how resources convert differently across heterogeneous circumstances, how agency and substantive freedom should enter evaluation, and how development extends beyond income or production. GRE can contribute a broader architecture for tracing institutional interfaces, power over conversion pathways, temporal propagation, capability interdependence, and the generation of future opportunity structures. The dialogue is strongest when capability theory continues to discipline GRE's account of human freedom while GRE treats the production and transformation of capability spaces as an explicit historical and relational research object.

Proposition 21.416 (Capability dialogue condition). *A productive dialogue preserves capability and human-development approaches as independent evaluative frameworks while using GRE to investigate the relational and temporal mechanisms through which substantive opportunities are formed, distributed, preserved, and transformed.*

21.21 Ecological Economics

This section extends the theory-specific dialogue to ecological economics. Its role is to examine a heterogeneous research tradition that places economic activity within material, energetic, ecological, and intergenerational relations whose dynamics cannot be reconstructed from monetary circulation alone. The objective is comparative and reconstructive. The discussion develops biophysical constraints, social metabolism, ecological limits, intergenerational relations, non-human relations, and incommensurable values; it then offers a GRE relational reconstruction and specifies limits of translation. The method is conceptual and historical, drawing on biophysical economics, sustainability theory, social–ecological systems analysis, resource economics, and plural approaches to valuation while preserving differences among them. Table 21.21 summarizes the principal dialogue coordinates.

Definition 21.417 (Ecological–economic configuration). *An ecological–economic configuration is an analytically specified arrangement of economic activities, material and energy flows, ecological stocks and processes, institutions, technologies, human and non-human affected positions, and temporal relations through which economic production, consumption, maintenance, and transformation depend on and alter ecological conditions.*

Ecological economics developed in part through dissatisfaction with representations of environmental problems as peripheral corrections to an otherwise self-contained economy. Costanza's early programmatic account described ecological economics as inquiry into relations between ecological and economic systems in a broad interdisciplinary sense (Costanza 1989). Material-balance analysis, thermodynamic reasoning, sustainability theory, systems analysis, social–ecological research,

and debates over valuation subsequently provided distinct routes into this shared field (Ayres and Kneese 1969; Georgescu-Roegen 1971; Daly 1990; Norgaard 1994; Ostrom 2009). The resulting tradition contains substantial internal disagreement concerning substitutability, scale, valuation, welfare, technological change, governance, and the appropriate relation between physical and monetary analysis.

Proposition 21.418 (Ecological reconstruction condition). *A relational reconstruction of ecological economics should preserve distinctions among biophysical feasibility, ecological capacity, social organization, valuation, distribution, institutional governance, and normative judgment while tracing the relations through which these dimensions condition one another.*

21.21.1 Biophysical Constraints

Biophysical constraints provide the first coordinate because ecological economics treats economic activity as materially and energetically situated. Production requires physical inputs, infrastructures, land, energy, and ecological processes; consumption and production generate residuals, emissions, heat, transformed matter, and accumulated stocks. Monetary accounts can record transactions while leaving these physical transformations incompletely represented. Ecological analysis therefore adds a domain of feasibility that remains relevant even where market values or financial flows appear internally balanced.

Definition 21.419 (Biophysical constraint). *A biophysical constraint is a material, energetic, thermodynamic, regenerative, assimilative, spatial, or ecological condition that limits, shapes, or conditions the feasible operation and continuation of an economic process within a specified system boundary and timescale.*

Ayres and Kneese's material-balance analysis made residual generation integral to the physical representation of production and consumption: material inputs remain physically consequential after market exchange and eventually enter products, stocks, wastes, or emissions (Ayres and Kneese 1969). Georgescu-Roegen developed a stronger thermodynamic account in which economic processes transform available matter and energy in ways characterized by irreversibility and qualitative degradation (Georgescu-Roegen 1971). These arguments establish a physical discipline on economic representation without supplying a complete theory of institutions, prices, or value.

The distinction between physical necessity and social organization is central. Conservation laws can constrain what transformations are physically possible, while technology, property, infrastructure, regulation, organizational routines, and consumption conventions affect which physically possible transformations are realized. A society can therefore encounter the same broad physical law through very different economic architectures. Biophysical embeddedness narrows the feasible domain while leaving substantial institutional and historical variation inside it.

Proposition 21.420 (Biophysical–institutional distinction). *A biophysical constraint can delimit feasible transformations without determining the institutional form, distributive arrangement, valuation regime, or normative priority through which economic actors respond to that constraint.*

Table 21.21: Relational coordinates for ecological economics

Coordinate	Ecological-economic analytical object	Dialogue boundary
Biophysical constraints	Material, energetic, regenerative, assimilative, and thermodynamic conditions of economic activity	Derivation of institutions, prices, distribution, or normative priorities directly from physical constraints
Social metabolism	Historically organized extraction, transformation, circulation, accumulation, consumption, and residual flows	Reduction of economic relations to material-flow accounting or treatment of monetary circulation as a sufficient physical description
Ecological limits	Thresholds, capacities, stocks, sinks, resilience properties, and Earth-system conditions relevant to continued activity	Treatment of every ecological limit as a fixed scalar ceiling or every technological response as unlimited substitution
Intergenerational relations	Transmission of resources, infrastructures, ecological conditions, risks, and option spaces through time	Identification of sustainability with one aggregate capital measure or one discounting rule
Non-human relations	Ecological dependence, causal participation, exposure, stewardship, represented interests, and forms of standing	Equation of ecological affectedness with agency, legal personhood, welfare, or one common normative status
Incommensurable values	Plural ecological, economic, cultural, ethical, capability, and relational values with partial or contested comparability	Presumption that monetary valuation exhausts significance or that plurality precludes every form of comparison
Relational reconstruction	Coupled history-bearing architecture linking economic and ecological processes, institutions, value, and power	Absorption of ecological economics into generic relational vocabulary without retaining biophysical specificity
Translation limit	Irreducibility of physical law, normative judgment, ecological knowledge, scale, uncertainty, and discipline-specific concepts	Identity inferred from shared concern with systems, relations, limits, resilience, or long-run generativity

This distinction also disciplines technological optimism and technological pessimism. Innovation can change conversion efficiency, material intensity, substitution possibilities, monitoring capacity, recovery processes, and the useful services obtained from a given resource flow. Such changes can materially alter local constraints. Their existence does not establish unbounded substitution because some ecological functions, spatial conditions, thresholds, or irreversible losses can remain

difficult or impossible to replace at relevant scales. The empirical question concerns which constraint is altered, by what mechanism, over which timescale, and with which displaced burdens.

Daly's operational sustainability principles illustrate the importance of process-specific capacities by relating renewable-resource use to regeneration and waste emission to assimilative capacity (Daly 1990). The analytical object is therefore dynamic. A stock that appears adequate at one date can become vulnerable when extraction exceeds renewal; a sink can become impaired when residual flows exceed its capacity to absorb or transform them. The future feasible set depends partly on rates and processes, not solely on contemporaneous quantities.

Proposition 21.421 (Dynamic biophysical condition). *Biophysical feasibility should be evaluated through stocks, flows, rates of renewal or degradation, relevant thresholds, and timescales whenever these dynamics materially affect later economic possibilities.*

GRE can translate these conditions as constraints acting within a history-bearing relational configuration. The translation becomes useful when economic institutions themselves alter later constraints through extraction, restoration, pollution, infrastructure, technological change, or land-use transformation. The resulting relation is recursive: current activity occurs within inherited ecological conditions and can contribute to the ecological conditions encountered by later activity. This recursive structure provides an interface with GRE's analysis of generativity while preserving the physical specificity contributed by ecological economics.

21.21.2 Social Metabolism

Social metabolism provides the second coordinate because material and energy flows acquire economic form through historically organized systems of extraction, transformation, circulation, accumulation, consumption, and disposal. The concept directs attention toward the physical reproduction of societies while retaining institutions, technologies, spatial organization, and social relations as mediating structures. It therefore provides a bridge between biophysical accounting and political-economic analysis.

Definition 21.422 (Social metabolism). *Social metabolism* denotes the historically organized processes through which a society or economic configuration appropriates material and energy, transforms and circulates them through infrastructures and production systems, accumulates them in stocks, consumes their services, and returns residuals to ecological systems.

Material-balance reasoning supplies one foundation for such analysis because physical inputs and residuals can be followed across stages that monetary accounts may separate (Ayres and Kneese 1969). The approach can reveal that a commodity transaction forms only one segment of a longer material history. A building incorporates extracted minerals, energy-intensive processing, transport, labor, land, and infrastructure; during use it requires maintenance and energy; at the end of use its materials may enter reuse, recycling, landfill, dispersion, or long-lived waste streams. The economic object consequently extends across a chain of transformations.

Social metabolism also makes spatial displacement visible. Consumption in one

jurisdiction can depend on extraction, land transformation, water use, emissions, or waste treatment elsewhere. National income accounts can attribute value to the place of exchange or production while ecological burdens propagate through supply chains and distant ecosystems. The relevant relational structure can therefore cross firm, sectoral, regional, and national boundaries.

Proposition 21.423 (Metabolic boundary). *An analysis of social metabolism should state the spatial, temporal, organizational, and material boundaries within which inputs, accumulated stocks, useful outputs, and residual flows are being traced.*

The metabolism concept remains broader than circularity. Recirculation, reuse, repair, remanufacture, or recycling can reduce some virgin inputs and residual outputs, yet large material systems continue to require energy and frequently depend on additions to physical stocks. Empirical circularity studies therefore examine actual flows rather than inferring closure from the presence of recycling practices (Haas et al. 2015). A metabolism can become less throughput-intensive while remaining physically open.

Institutional organization affects metabolic form. Product standards, property rights, infrastructure, procurement rules, energy systems, urban design, taxation, trade arrangements, waste regulation, and business models can influence which materials move, how long stocks remain in service, and where residuals are transferred. Social metabolism is therefore neither a purely ecological process nor a free-standing social metaphor. It describes a physical process whose organization is socially and institutionally structured.

Proposition 21.424 (Metabolic mediation condition). *A metabolic account becomes economically explanatory when it identifies the institutions, technologies, infrastructures, and relations that organize material and energy flows in addition to measuring the flows themselves.*

GRE can extend this account by tracing how metabolic architectures redistribute generative capacity. A transport system can expand mobility while locking later investment into material-intensive infrastructures. A supply chain can generate income in one location while transferring pollution risk to another. A repair ecosystem can preserve material stocks and simultaneously maintain local knowledge, employment, and organizational capability. These are relational consequences coupled to physical flows. The GRE contribution lies in tracing their propagation across heterogeneous value dimensions; the ecological-economic contribution lies in ensuring that this tracing remains constrained by the material carriers and ecological processes through which those consequences occur.

21.21.3 Ecological Limits

Ecological limits provide the third coordinate because economic activity occurs within ecological processes that possess finite stocks, regenerative rates, assimilative capacities, thresholds, and resilience properties. The analytical problem concerns the conditions under which economic scale and composition remain compatible with continued ecological functioning. This problem differs from scarcity among substitutable market goods because some ecological changes can alter the conditions within which later substitution, production, and welfare become possible.

Definition 21.425 (Ecological limit). An *ecological limit* is a context-specific boundary, threshold, capacity, stock condition, rate condition, or risk region beyond which additional pressure materially increases the likelihood of ecological degradation, loss of function, regime change, or contraction of relevant future possibilities.

The definition is deliberately plural. Some limits concern depletion of a stock; others concern regeneration rates, pollution loads, habitat fragmentation, biodiversity, climatic conditions, or coupled Earth-system processes. Some can be approximated through relatively continuous response functions, while others involve nonlinear change, uncertainty, or path dependence. The existence of ecological constraint therefore does not imply that every ecological process has one precisely known scalar threshold.

Holling's distinction between resilience and stability is relevant because persistence under disturbance differs from rapid return toward an equilibrium state (Holling 1973). An ecosystem can retain important relations across substantial variation, while another can appear stable until a disturbance moves it into a different regime. Economic governance based solely on average conditions can consequently miss the significance of response structure and recovery capacity.

The planetary-boundaries framework provides a large-scale example of limit-oriented reasoning. Steffen and colleagues identify interacting Earth-system processes and propose boundaries intended to characterize a space of lower systemic risk for human development (Steffen et al. 2015). Such boundaries are scientific risk frameworks rather than prices, legal entitlements, or complete policy rules. Translation into economic action requires institutional judgment concerning burden sharing, uncertainty, responsibility, technology, distribution, and development needs.

Proposition 21.426 (Limit-to-governance condition). *Identification of an ecological limit or risk boundary should be followed by a separate analysis of the institutional, distributive, technological, and normative mechanisms through which economic activity is expected to respond.*

Natural-capital debates expose a related issue concerning substitution. Costanza and Daly argue for maintaining natural capital under uncertainty and question reliance on substitution where ecological functions may be critical or poorly replaceable (Costanza and Daly 1992). A relational formulation can make the disagreement more precise by asking which function is being substituted, which beneficiaries and affected systems are included, which spatial and temporal scales are relevant, and what residual losses remain after substitution.

Proposition 21.427 (Substitution-specification condition). *Claims of ecological substitutability should specify the function being replaced, the substitute mechanism, affected subjects or systems, relevant scales and timescales, and the residual value or capacity losses that remain after the proposed substitution.*

GRE's criticality vocabulary can sometimes enter this dialogue, but the correspondence requires restraint. An ecological threshold, a regulatory limit, and a dynamical critical transition are different concepts. Evidence of nonlinear response or abrupt regime shift can motivate criticality analysis; the language of criticality should remain conditional on an identified dynamical mechanism. Ecological economics con-

tributes the substantive ecological variables and processes against which such a formal description would need to be tested.

Ecological limits also create a generative question. Economic action can preserve, erode, or restore capacities upon which later action depends. A wetland, forest, aquifer, soil system, climate regime, or pollinator network can participate in the generation of future economic possibilities through ecological functions that are not reducible to contemporaneous output. GRE can therefore treat ecological capacity preservation as a form of future-option preservation where the empirical mechanism is established, while ecological economics supplies the biophysical content and measurement discipline for that claim.

21.21.4 Intergenerational Relations

Intergenerational relations provide the fourth coordinate because ecological decisions can transmit resources, infrastructures, pollution stocks, climatic conditions, biodiversity, technologies, knowledge, risks, and institutional commitments to persons who enter the economic field later. The temporal asymmetry is substantial: present actors can alter future conditions while future persons generally cannot participate symmetrically in current bargaining or markets. Ecological economics therefore connects sustainability to questions of capital, substitution, discounting, uncertainty, and justice.

Definition 21.428 (Intergenerational ecological relation). An *intergenerational ecological relation* is a temporally extended causal and institutional connection through which actions, infrastructures, ecological changes, or governance arrangements in one period alter the resources, risks, capacities, constraints, or substantive options available to persons and communities in later periods.

Resource economics offers a formal route into this problem. Solow analyzes intergenerational consumption possibilities under exhaustible-resource use and substitution with reproducible capital, while Hartwick identifies conditions under which investing resource rents can sustain constant per-capita consumption in a specified model (Solow 1974; Hartwick 1977). These results clarify how substitution and investment can mediate depletion under particular assumptions. Ecological economics raises an additional question concerning the ecological functions for which manufactured substitutes may be limited, uncertain, or unavailable.

The resulting disagreement should be located at the level of assumptions rather than described as a simple opposition between economics and ecology. Relevant questions include whether the depleted resource provides one service or several, whether those services are separable, whether substitutes exist at sufficient scale, whether ecological thresholds are known, how uncertainty is treated, and which distribution of risk across generations is acceptable. The sustainability conclusion can change when these assumptions change.

Proposition 21.429 (Intergenerational transmission condition). An *intergenerational sustainability analysis* should identify the ecological or productive capacities transmitted through time, the mechanism of preservation or substitution, the relevant uncertainty, and the distribution of residual risk among later affected populations.

Discounting is one institutionalized method for comparing temporally distributed consequences, yet the choice of discounting framework includes empirical and normative commitments. Long-lived ecological damage can receive sharply different present weights under different rates and formulations. Rights, safe-minimum standards, preservation rules, liability regimes, and public investment can encode different temporal relations. Ecological economics makes these choices visible as part of economic evaluation.

GRE can reconstruct intergenerational relations through history-bearing configurations. Future persons need not be simultaneously present for current arrangements to alter their feasible conditions. Infrastructure, debt, educational systems, legal institutions, ecological stocks, and technological platforms can carry consequences forward. The relation is mediated through persistent structures and altered environments rather than contemporaneous exchange.

Proposition 21.430 (Future-option inheritance). *Present economic activity can generate an intergenerational consequence when it materially changes the feasible options, ecological capacities, institutional burdens, or risk exposures inherited by later populations.*

This formulation also separates sustainability from justice. Preservation of an aggregate productive capacity can coexist with unequal exposure to ecological harm, and equal present distribution can coexist with severe future capacity loss. Intergenerational evaluation therefore requires at least two analytically distinguishable questions: whether relevant capacities persist and how benefits, burdens, risks, and decision rights are distributed across time and populations.

The GRE concept of generativity creates a natural interface because present arrangements can expand or contract later spaces of action. Ecological economics strengthens that interface by identifying biophysical pathways through which generative consequences are carried. The translation remains partial: a larger future option space is not automatically ecologically sustainable, and ecological sustainability does not by itself specify a just distribution of those options.

21.21.5 Non-Human Relations

Non-human relations provide the fifth coordinate because economic processes depend on and affect ecological entities and systems that frequently fall outside conventional models of market agency. Soils, watersheds, forests, species assemblages, animals, climatic processes, and material infrastructures can participate causally in economic life through provisioning, regulation, exposure, vulnerability, and ecological interdependence. Their economic relevance does not require treating all of them as equivalent subjects or assigning them one common normative status.

Definition 21.431 (Non-human ecological relation). *A non-human ecological relation is an economically consequential connection involving a non-human organism, population, ecosystem, material system, or ecological process through dependence, causal participation, exposure, stewardship, representation, or another explicitly specified form of standing.*

Ecosystem-services research made many forms of ecological dependence legible

to economic analysis by identifying contributions of ecological systems to human life and economic activity (Costanza, d'Arge, et al. 1997). Monetary valuation can support comparison, policy visibility, or damage assessment in some contexts. The same ecological configuration can also possess cultural, ethical, ecological, relational, or existence significance that is imperfectly captured by a monetary estimate. The analytical task is therefore to specify what form of relation and value a particular representation is intended to capture.

Non-human affectedness should remain distinct from agency. An ecosystem can be substantially altered by extraction or pollution without choosing, bargaining, or expressing preferences. Sentient animals can raise welfare questions that differ from questions concerning species persistence or ecosystem function. A river can possess legal standing in one institutional order without becoming an optimizing agent. A forest can be materially indispensable to livelihoods while its ecological importance extends beyond its contribution to human income. These distinctions prevent a broad relational vocabulary from flattening heterogeneous forms of relevance.

Proposition 21.432 (Affectedness–agency distinction). *Economic analysis should specify whether a non-human configuration enters the inquiry through causal participation, exposure, welfare, ecological function, legal standing, cultural relation, stewardship responsibility, or another identified dimension, and should avoid inferring agency from affectedness alone.*

Representation becomes an institutional problem where affected positions cannot participate through ordinary market or deliberative channels. Scientific monitoring, environmental law, guardianship, customary institutions, conservation organizations, community knowledge, ethical argument, and public agencies can represent different dimensions of ecological concern. Each representation selects variables, scales, baselines, and categories. The resulting manifestational layer can make some relations visible while leaving others obscure.

Ostrom's social–ecological systems framework illustrates the value of analyzing resource systems, resource units, governance systems, users, interactions, and outcomes together (Ostrom 2009). The framework does not require identical agency across components. Its analytical contribution lies in showing that sustainability outcomes emerge through coupled ecological and institutional relations. Norgaard's coevolutionary account similarly emphasizes reciprocal change between social and ecological systems (Norgaard 1994).

Proposition 21.433 (Ecological representation condition). *Where non-human affected positions enter economic decision through human institutions or scientific representations, analysis should identify the representational mechanism, its evidential basis, the dimensions retained, and the dimensions that may remain unrepresented.*

GRE can accommodate non-human relations because its analytical domain is not restricted to point-like maximizing actors. The gain is an ability to trace relations of dependence, power, exposure, mediation, and future capacity across heterogeneous participants. Ontological restraint remains important. Relational inclusion does not establish consciousness, personhood, rights, welfare, or moral standing. Those claims require separate philosophical, scientific, legal, or political argument appropriate to the case.

21.21.6 Incommensurable Values

Incommensurable values provide the sixth coordinate because ecological decisions frequently involve heterogeneous dimensions that resist complete representation through a single metric. Market income, human health, biodiversity, livelihood, cultural attachment, ecological integrity, animal welfare, landscape meaning, capability, intergenerational interest, and option value can enter the same decision while differing in units, evidential bases, institutional recognition, and normative status. Ecological economics therefore places valuation itself inside the research problem.

Definition 21.434 (Ecological value plurality). *Ecological value plurality* is a configuration in which several ecologically relevant dimensions of value are recognized while their relations of comparability, commensurability, aggregation, and institutional priority remain explicitly specified rather than presumed in advance.

Plurality does not imply that comparison is impossible. Some decisions permit robust comparison within one dimension; others permit partial ordering, thresholds, constraints, multi-criteria reasoning, deliberative judgment, or monetary valuation for a specified purpose. Incommensurability identifies limits to a common measure, whereas incomparability concerns whether two alternatives can be ordered within a particular evaluative relation. These distinctions matter because declaring values “incommensurable” can otherwise obscure the practical forms of comparison that institutions actually use.

Research on commensuration shows that conversion to a common metric is itself a social and political process with consequences for what becomes visible and actionable (Espeland and Stevens 1998). Fourcade’s analysis of the monetary valuation of nature similarly demonstrates that economic valuation involves institutionalized techniques, cultural assumptions, and feedback into the way nature is represented (Fourcade 2011). Monetary valuation can therefore be analytically useful while remaining a transformation of heterogeneous significance into a particular comparison format.

Proposition 21.435 (Valuation-interface condition). *An ecological valuation should state which value dimensions enter the comparison, which conversion or aggregation procedure is used, which dimensions remain outside that procedure, and how the resulting representation affects decision authority and distribution.*

This point connects directly to GRE’s analysis of heterogeneous value and conversion interfaces. An ecological service may be converted into a monetary damage estimate, a regulatory threshold, a conservation category, a legal right, a public-health indicator, or a cultural-protection claim. Each conversion enables some forms of coordination while potentially discarding other properties. Control over the interface can therefore become a form of power: actors able to determine the accepted metric can influence which harms and benefits become institutionally legible.

Anderson’s account of plural modes of valuation supplies a broader philosophical support for retaining qualitative differences among goods and evaluative relations (Anderson 1993). GRE can use this plurality to analyze value conversion without presupposing that every value must terminate in a common scalar. At the same time, plural valuation does not remove the need to decide. Public institutions often require budgets, standards, priorities, permits, or prohibitions. The challenge is to make the

conversions and residual remainders visible enough for those judgments to remain contestable.

Proposition 21.436 (Ecological conversion remainder). *When heterogeneous ecological values are translated into a common decision metric, the analysis should preserve any materially relevant value remainder whose exclusion could alter the interpretation, distribution, legitimacy, or reversibility of the decision.*

The domain of adequacy for monetary valuation is consequently conditional. Monetary estimates can support compensation analysis, cost comparison, budgeting, liability, or the visibility of previously ignored ecological functions. They become less informative where ecological thresholds, rights, irreversible losses, non-substitutable functions, or plural normative commitments dominate the decision. Ecological economics contributes a discipline of matching valuation method to evaluative object rather than treating one metric as universally sufficient.

21.21.7 Relational Reconstruction

The preceding coordinates permit a GRE reconstruction that preserves ecological economics as an independent source of biophysical and evaluative discipline. The central object is a history-bearing social–ecological configuration in which economic subjects, institutions, technologies, infrastructures, ecological processes, material flows, value systems, and governance arrangements co-condition one another over time. The reconstruction asks how these relations generate, preserve, redistribute, or erode later capacities while maintaining a distinction between physical mechanism and relational interpretation.

Definition 21.437 (Generative ecological architecture). *A generative ecological architecture is a history-bearing configuration of ecological processes, economic relations, institutions, technologies, infrastructures, and value-conversion mechanisms through which present activity changes the capacities and constraints governing subsequent ecological and economic possibilities.*

The first element is material grounding. GRE's relations require carriers and conditions where the phenomenon is materially instantiated. Food relations depend on soils, water, energy, organisms, transport, storage, knowledge, and institutions. Urban mobility depends on land, infrastructures, energy systems, vehicles, regulation, settlement patterns, and maintenance. A relational description that omits these physical conditions would lose part of the causal architecture identified by ecological economics.

The second element is temporal propagation. Extraction can produce present value while altering future stocks; restoration can impose present cost while improving later ecological capacity; infrastructure can create long-lived patterns of resource demand; pollution can accumulate before consequences become visible. GRE can represent these processes as changes in a history-bearing configuration whose effects appear at several later timescales.

Proposition 21.438 (Ecological generativity condition). *An ecological process should be described as generative within GRE only when a specified present relation or intervention can be linked through an evidenced mechanism to a change in later ecological,*

economic, institutional, or capability conditions.

The third element is power. Ecological burdens and benefits are often distributed through property, regulation, infrastructure, trade, finance, territorial control, knowledge, and political representation. Actors with greater capacity to determine land use, extraction rates, technological standards, siting, acceptable evidence, or valuation metrics can shape the ecological conditions encountered by others. Ecological inequality therefore concerns more than unequal outcomes; it can include unequal authority over the processes that generate those outcomes.

Definition 21.439 (Ecological conversion power). *Ecological conversion power* is the relational capacity to influence the institutional interfaces through which ecological conditions, harms, services, risks, or values are translated into recognized economic categories, rights, prices, standards, or decisions.

The fourth element is representation. Ecological states are known through measurements, classifications, models, remote sensing, indicators, local knowledge, administrative records, and scientific inference. GRE's manifestation-reality distinction can help separate an ecological condition from the indicator used to represent it. A carbon price, biodiversity index, environmental-impact score, or satellite measure can be decision-relevant while remaining a partial representation of a more complex ecological configuration.

Proposition 21.440 (Ecological manifestation condition). *A GRE reconstruction should distinguish ecological processes from the indicators and classifications through which they become institutionally visible whenever representational choices materially affect inference or decision.*

The fifth element is regeneration. Ecological economics makes clear that preservation can be dynamic. Maintaining a stock can require continuing renewal, maintenance, disturbance regimes, institutional restraint, or active restoration. Generative analysis therefore includes both creation of new capacity and preservation of capacity against credible degradation. This structure parallels the book's broader treatment of preservation without converting ecological regeneration into a generic metaphor.

A final element is scale. Relations that appear sustainable locally can depend on burdens displaced elsewhere; efficiencies at a facility can coexist with rising aggregate throughput; restoration at one site can be outweighed by degradation across a wider landscape. A GRE ecological analysis should therefore state the scale at which generative consequences are assessed and examine cross-scale propagation where it affects the conclusion.

Proposition 21.441 (Cross-scale ecological condition). *Claims about ecological generation, preservation, or sustainability should identify the relevant spatial and temporal scale and examine displaced or propagated effects across other scales when those effects can materially alter the assessment.*

This reconstruction gives GRE a stronger ecological discipline while giving ecological economics a vocabulary for tracing heterogeneous relational consequences. The contribution is reciprocal. Ecological economics constrains GRE's generative analysis through material, energetic, and ecological processes; GRE connects those processes to power, value conversion, institutional formation, epistemic mediation, subject het-

erogeneity, and future option structures. The dialogue remains productive to the extent that each tradition retains the concepts through which it detects failures in the other.

21.21.8 Limits of Translation

The translation between ecological economics and GRE is extensive because both can analyze interdependence, history, heterogeneous value, feedback, capacity, uncertainty, and future possibility. The overlap nevertheless leaves important remainders. Ecological economics contains biophysical claims that retain validity independently of GRE's relational vocabulary, while GRE includes social, institutional, normative, and generative objects whose behavior cannot be inferred from ecological law. Productive dialogue therefore requires explicit limits to translation.

Definition 21.442 (Ecological translation remainder). *An ecological translation remainder is a biophysical law, ecological mechanism, normative commitment, measurement problem, scale dependence, uncertainty, or theory-specific concept whose analytical role would be weakened or altered if translated completely into GRE's general vocabulary of relations, constraints, value, and generativity.*

The first remainder is physical law. Thermodynamic and material constraints can be represented relationally, yet their validity does not depend on a relational interpretation. GRE should therefore avoid redescribing physical necessity as if it were produced by social relation alone. Social systems can alter technologies, efficiencies, extraction patterns, and institutional responses; they operate within physical regularities whose investigation belongs to the relevant natural sciences.

Proposition 21.443 (Biophysical non-reduction condition). *GRE translation should preserve independently established biophysical mechanisms and constraints as substantive scientific inputs rather than treating them as consequences of relational description.*

The second remainder concerns normativity. An ecological threshold does not by itself determine a fair burden-sharing rule, a legitimate property arrangement, or an acceptable development pathway. Conversely, an ethically attractive distribution cannot eliminate a biophysical constraint. Ecological governance therefore requires both empirical ecological knowledge and normative-institutional judgment, with neither domain substituting automatically for the other.

The third remainder concerns scale and boundary selection. Ecological conclusions depend strongly on system boundaries, baselines, temporal horizons, spatial aggregation, and the chosen variable of interest. GRE's scale-sensitive architecture can represent this dependence, yet it does not select the correct ecological scale in advance. Domain expertise and empirical research remain necessary.

The fourth remainder concerns uncertainty and irreversibility. Some ecological processes involve incomplete knowledge, long delays, threshold uncertainty, or losses that are difficult to reverse at relevant timescales. A generative vocabulary can express future-option contraction, yet it should not convert uncertainty into a precise formal object without evidence. Precaution, robustness, safe-minimum standards, adaptive governance, and other decision principles remain separate

institutional responses that require their own justification.

Proposition 21.444 (Ecological uncertainty condition). *Where ecological knowledge is incomplete and potential losses are persistent or difficult to reverse, analysis should keep empirical uncertainty distinct from normative choice about precaution, acceptable risk, and burden distribution.*

The fifth remainder concerns value. GRE's heterogeneous-value architecture aligns strongly with ecological pluralism, yet the existence of several value dimensions does not determine how conflicts among them should be resolved. Monetary valuation, rights, thresholds, deliberation, capability criteria, ecological integrity, and legal protections can yield different decision structures. GRE can expose conversion interfaces and power over them; it cannot derive one universally appropriate evaluative rule from relationality alone.

The sixth remainder concerns non-human standing. GRE can include non-human affected positions in its analytical domain, but relational inclusion does not establish moral status, welfare, rights, or legal personhood. Ecological economics itself also contains divergent positions on anthropocentric, biocentric, ecocentric, and instrumental valuation. Translation should preserve these disagreements as normative and philosophical questions rather than silently resolving them through the category of relation.

Proposition 21.445 (Ecological–GRE non-identity). *Shared attention to interdependence, capacity, history, heterogeneous value, and future conditions supports substantial dialogue between ecological economics and GRE while leaving biophysical, normative, methodological, and scale-specific commitments analytically distinct.*

The domain of adequacy is therefore complementary. Ecological economics is especially strong where the research question concerns material and energy throughput, ecological capacity, regeneration, sinks, social metabolism, Earth-system risk, resilience, natural-capital dependence, and the ecological conditions of sustainability. GRE can contribute a wider architecture for tracing how these processes interact with institutions, power, value conversion, epistemic representation, subject heterogeneity, and the generation of future possibilities. Ecological economics in turn constrains GRE by requiring generative claims to remain physically grounded wherever ecological processes carry the causal mechanism.

Proposition 21.446 (Ecological dialogue condition). *A productive dialogue preserves ecological economics as an independent source of biophysical and sustainability analysis while using GRE to investigate the relational architectures through which ecological capacities, burdens, values, and future possibilities are generated, distributed, represented, and transformed.*

21.22 Commons, Cooperative, and Solidarity Economics

This section extends the theory-specific dialogue to commons, cooperative, and solidarity economics. Its role is to examine economic arrangements in which access, ownership, contribution, reciprocity, governance, and value formation are organized through collectively constituted relations that cannot be reconstructed adequately from bilateral market exchange or unitary ownership alone. The objective is com-

parative and reconstructive. The discussion develops commons, collective ownership, reciprocity, cooperation, collective governance, and community value; it then offers a GRE relational reconstruction and specifies limits of translation. The method is institutional, historical, and relational, drawing on commons research, cooperative principles and labor-managed-firm theory, substantive economic anthropology, peer-production analysis, relational-goods scholarship, and solidarity-economy research while preserving the differences among these traditions. Table 21.22 summarizes the principal dialogue coordinates.

Definition 21.447 (Collectively organized economic configuration). A *collectively organized economic configuration* is an analytically specified arrangement in which several participants jointly constitute or govern economically consequential rights, resources, contributions, obligations, benefits, rules, or purposes through relations whose operation depends on a collective structure rather than on isolated bilateral exchange alone.

Commons, cooperatives, and solidarity-economy initiatives are related without forming one homogeneous organizational family. Commons research examines shared resources and the institutions through which access, appropriation, maintenance, monitoring, exclusion, and rule change are organized (Ostrom 1990; Schlager and Ostrom 1992). Cooperative traditions emphasize jointly owned and democratically controlled enterprises whose members organize economic participation around specified principles and purposes (International Cooperative Alliance 1995; International Cooperative Alliance 2017). Solidarity-economy research covers a wider range of associative and self-managed initiatives concerned with democratizing economic activity and connecting economic organization to social and political solidarity (Laville 2010). These traditions can intersect in practice while remaining analytically distinct.

Proposition 21.448 (Collective-form non-equivalence). *Shared resources, collective ownership, reciprocal exchange, cooperative production, collective governance, and solidarity-oriented purpose can coexist within one economic arrangement, yet none of these properties establishes the presence of the others without additional institutional evidence.*

21.22.1 Commons

Commons provide the first coordinate because they make the institutional organization of shared resources analytically visible. The term can refer to natural-resource systems, knowledge, infrastructure, cultural resources, digital production, or other shared objects, but these domains differ substantially in subtractability, congestion, replenishment, monitoring, exclusion costs, and technological conditions. A useful reconstruction therefore begins with the resource and the governance relations separately before examining how they become coupled.

Definition 21.449 (Commons configuration). A *commons configuration* is a resource or resource system together with a historically situated arrangement of participants, access conditions, appropriation rules, contribution obligations, maintenance practices, monitoring, sanctions, conflict-resolution procedures, exclusion relations, and rule-changing capacities through which shared use is organized.

Table 21.22: Relational coordinates for commons, cooperative, and solidarity economics

Coordinate	Collective-economic analytical object	Dialogue boundary
Commons	Shared-resource relations linking access, appropriation, contribution, maintenance, monitoring, exclusion, and rule change	Equation of commons with open access, public ownership, or one universal governance design
Collective ownership	Distributed bundles of use, benefit, governance, exclusion, transfer, and residual claims	Inference of equal control, equal benefit, or democratic practice from a collective-ownership label alone
Reciprocity	Temporally and socially organized return relations involving expectation, obligation, trust, recognition, or mutual responsiveness	Reduction of reciprocity to simultaneous equivalent exchange or presumption that every reciprocal relation is normatively desirable
Cooperation	Coordinated contribution through which participants create outcomes dependent on joint action or complementary roles	Identification of cooperation with harmony, altruism, absence of conflict, or one organizational form
Collective governance	Rule-making, monitoring, enforcement, revision, conflict resolution, and representation distributed across participants or centers of authority	Assumption that participation is equal, frictionless, or effective merely because governance is formally collective
Community value	Value generated, sustained, recognized, or distributed through shared relations, infrastructures, identities, practices, and collective capacities	Romanticization of community or treatment of communal significance as automatically measurable by one scalar metric
Relational reconstruction	History-bearing architecture connecting membership, resources, rights, contribution, governance, value, power, and future collective capacity	Absorption of institutional specificity into generic relational language
Translation limit	Irreducibility of legal form, political commitment, cultural meaning, lived solidarity, and situated governance knowledge	Identity inferred from shared vocabulary of relation, participation, generation, or collective capacity

Hardin's influential tragedy model formalized one pathway through which unrestricted individual appropriation can degrade a shared resource (Hardin 1968). Ostrom's empirical programme demonstrated that common-pool resources can also be

governed through diverse self-organized institutional arrangements, with outcomes depending on rules, monitoring, local conditions, participant relations, and the capacity to adapt governance over time (Ostrom 1990; Ostrom 2005). The contrast is analytically useful because it separates a resource characteristic from an institutional conclusion. A resource can create appropriation dilemmas while leaving several governance architectures available.

Proposition 21.450 (Commons–open-access distinction). *The existence of shared use does not establish open access. A commons can contain specified membership, use rights, contribution duties, monitoring, exclusion procedures, and collective-choice rules that differentiate authorized participation from unrestricted entry.*

Property relations within commons are also multidimensional. Schlager and Ostrom distinguish positions associated with access, withdrawal, management, exclusion, and alienation, showing that property regimes can distribute operational and collective-choice rights across participants in ways that resist a simple private/public binary (Schlager and Ostrom 1992). The same point matters for GRE: the relevant economic object is the distribution of rights and capacities across a relational configuration, together with the history through which that distribution is maintained or revised.

Commons analysis has expanded beyond natural-resource settings. Knowledge commons raise distinct questions because informational resources can often be copied or used simultaneously while still depending on institutions of access, preservation, attribution, enclosure, and collective governance (Hess and Ostrom 2007). Commons-based peer production likewise demonstrates that distributed contributions can sustain large-scale productive activity through coordination mechanisms that differ from both price allocation and managerial hierarchy (Benkler 2002). These extensions strengthen the analytical importance of commons while cautioning against transferring one resource-governance model unchanged across domains.

Proposition 21.451 (Commons-domain specificity). *A governance principle established for one commons domain should be translated to another only after the relevant resource properties, participant relations, contribution structure, exclusion technology, and maintenance requirements have been specified.*

21.22.2 Collective Ownership

Collective ownership provides a second coordinate because commons, cooperatives, mutual organizations, community enterprises, and solidarity initiatives frequently distribute claims across several participants. The economically relevant issue is the architecture of those claims. Ownership can concern possession, use, income, residual benefit, decision authority, exclusion, transfer, liability, inheritance, or other legally and institutionally recognized positions. Collective ownership therefore requires a map of differentiated rights rather than a single binary variable.

Definition 21.452 (Collective ownership architecture). *A collective ownership architecture is a rule-governed distribution of ownership-related rights, claims, responsibilities, and residual positions across multiple participants or a collectively constituted entity, including the procedures through which those positions are exercised, delegated, transferred, revised, or contested.*

The cooperative tradition provides one established architecture. The International Cooperative Alliance defines a cooperative through voluntary association, joint ownership, and democratic control, together with principles concerning membership, member economic participation, autonomy, education, cooperation among cooperatives, and concern for community (International Cooperative Alliance 1995; International Cooperative Alliance 2017). Labor-managed-firm theory develops a different analytical route by examining enterprises in which workers participate in governance and income distribution through institutional forms distinct from conventional capital-managed firms (Vanek 1970). These sources illuminate different dimensions of collective ownership: one emphasizes historically articulated institutional principles, while the other examines economic behavior under a specified governance form.

Proposition 21.453 (Collective ownership and effective control). *Collective ownership can distribute formal claims broadly while effective control remains differentiated through information, expertise, delegation, agenda authority, financing, managerial position, participation costs, or external dependency. Analysis should therefore reconstruct effective control separately from formal ownership status.*

The distinction is particularly important where delegated management is necessary. Members can retain constitutional authority while professional managers exercise substantial operational discretion. External lenders, platforms, suppliers, regulators, or technical infrastructures can also shape feasible choices. Conversely, limited formal ownership can coexist with meaningful voice, use rights, or veto powers. Property-rights analysis of firms likewise shows that ownership and control can be partitioned in several ways rather than represented by a unitary owner with exhaustive authority (Hart and Moore 1990).

Collective ownership also reorganizes exit and transfer. Some arrangements restrict alienation so that collectively accumulated assets remain attached to a purpose, locality, membership body, or future cohort. Such restrictions can preserve continuity and common capacity, while they can also constrain liquidity and individual exit. The economic consequence depends on the relation among membership, residual claims, asset locks or transfer rules, investment needs, and the availability of alternative institutions.

Proposition 21.454 (Collective-asset temporal relation). *Where collective assets are accumulated across successive cohorts, ownership architecture can mediate intertemporal relations between present members, former contributors, future participants, and the continuing organization. Present control and historically generated collective value therefore need not coincide.*

21.22.3 Reciprocity

Reciprocity supplies a third coordinate because many collective economic arrangements depend on return relations whose timing, form, and equivalence remain partially open. Polanyi treated reciprocity as one institutional pattern through which economies can be organized, distinct from redistribution and market exchange in his substantive account of the instituted economy (Polanyi 1957). Mauss's analysis of gift exchange likewise emphasized socially organized obligations to give, receive,

and reciprocate, demonstrating that transfers can be embedded in legal, moral, political, religious, and status relations (MauSS 1990). Reciprocity therefore belongs to economic analysis even when contemporaneous price equivalence is absent.

Definition 21.455 (Reciprocal economic relation). A *reciprocal economic relation* is a temporally extended pattern in which a contribution, benefit, restraint, service, recognition, or other economically consequential act is linked to an expectation, norm, disposition, or institution of responsive return whose timing, recipient, form, and equivalence can be partly unspecified.

This definition distinguishes reciprocity from a spot exchange with fully specified terms. A reciprocal return can occur later, take a different form, benefit another member of a group, or remain contingent on need. It can also concern conduct rather than transfer: restraint in appropriating a shared resource can be sustained partly by expectations that others will exercise comparable restraint. Ostrom's behavioral account of collective action identifies reciprocity, reputation, and trust as mechanisms that can support cooperation under some social-dilemma conditions (Ostrom 1998).

Proposition 21.456 (Reciprocity and equivalence). *Reciprocity does not require contemporaneous scalar equivalence between contribution and return. Its economic structure can depend on temporal expectation, social recognition, reputation, membership, need, norm, or repeated interaction whose consequences cannot be represented fully by a single exchange ratio.*

Reciprocity can generate both capacity and constraint. Repeated mutual support can build trust, insurance-like protection, information sharing, commitment, or willingness to invest in a collective project. Reciprocal expectations can also become exclusionary, burdensome, status-laden, or difficult to exit. A community can impose disproportionate obligations on members with fewer resources or stronger social dependence. Reciprocity consequently requires analysis of power, voluntariness, sanction, alternatives, and differentiated burden.

Proposition 21.457 (Reciprocity power condition). *The presence of reciprocal expectation does not establish symmetrical bargaining position or equal burden. A reciprocal arrangement should be evaluated through the distribution of obligation, sanctioning capacity, alternatives, recognition, and effective exit as well as through observed return behavior.*

21.22.4 Cooperation

Cooperation concerns the organization of joint activity through which participants produce outcomes that depend on coordinated contribution, complementary roles, mutual restraint, shared infrastructure, or some combination of these relations. It appears in firms, households, research communities, mutual-aid systems, commons, cooperatives, supply networks, open-source projects, public institutions, and many market interactions. The analytical category is therefore broader than cooperative enterprise as a legal or organizational form.

Definition 21.458 (Economic cooperation). *Economic cooperation* is coordinated activity among two or more participants in which the realized outcome depends materially on relations among their contributions, roles, expectations, or restraints, so that

the relevant productive or governing process cannot be reconstructed as a simple sum of isolated actions.

Cooperation can be motivated by several mechanisms. Participants can cooperate because of shared purpose, contractual obligation, repeated interaction, reciprocal expectation, identity, reputation, complementary specialization, institutional rule, material interdependence, or anticipated individual benefit. These mechanisms can coexist. Behavioral and institutional work on collective action therefore cautions against identifying cooperation with a single preference type or assuming that observed cooperative conduct reveals one stable motivation (Ostrom 1998; Ostrom 2005).

Proposition 21.459 (Cooperation–motivation distinction). *Observed cooperation identifies a pattern of coordinated action. Attribution of altruism, solidarity, self-interest, norm compliance, trust, coercion, or another motivation requires additional evidence concerning the mechanism through which coordination is sustained.*

Cooperation can also contain disagreement and competition. Members of a cooperative can contest strategy, compensation, investment, or membership rules while continuing to coordinate production. Commons users can compete for access while jointly maintaining the resource. Federated organizations can cooperate in some domains and bargain adversarially in others. The presence of conflict therefore does not dissolve cooperation; the analytical task is to identify which relations remain jointly organized and how disputes are processed.

Peer production provides an especially useful case because large-scale cooperation can occur across distributed contributors with weak reliance on conventional employment or market pricing. Benkler's analysis emphasizes the feasibility of coordination through modular tasks, distributed participation, and nonproprietary or commons-oriented arrangements under some informational and technological conditions (Benkler 2002). GRE can treat such systems as collective generative architectures while retaining the institutional specifics that make distributed cooperation workable.

Proposition 21.460 (Cooperative-capacity condition). *A cooperative arrangement is generatively significant when relations among participants create or preserve collective capabilities, infrastructures, knowledge, trust, coordination capacity, or future options that would be weakly available to the same participants acting separately under the relevant conditions.*

21.22.5 Collective Governance

Collective governance concerns the rules and procedures through which participants shape common economic conditions. It includes agenda formation, deliberation, voting, consent, delegation, monitoring, sanctioning, conflict resolution, constitutional revision, and relations among multiple centers of authority. Formal participation is one component. Effective governance additionally depends on information, time, expertise, accessibility, enforcement capacity, representation, and the practical ability to revise rules.

Definition 21.461 (Collective governance architecture). *A collective governance*

architecture is the historically constituted distribution of authority, voice, information, monitoring, enforcement, representation, delegation, conflict-resolution capacity, and rule-changing power through which multiple participants organize economically consequential common affairs.

Ostrom's institutional analysis is important because it treats rules in use, participant attributes, action situations, interactions, and outcomes as connected analytical objects rather than assuming that one formal rule determines behavior (Ostrom 2005). Durable commons can involve locally adapted arrangements for monitoring, sanctions, conflict resolution, and rule modification (Ostrom 1990). Polycentric governance extends the analysis to systems with multiple centers of decision making whose relations can include coordination, competition, overlap, experimentation, and mutual adjustment (Ostrom 2010).

Proposition 21.462 (Formal voice and effective governance). *Formal participation rights establish one dimension of collective governance. Effective governance additionally depends on the capacity to obtain information, enter deliberation, influence agendas, exercise or contest delegated authority, monitor implementation, and participate in rule revision.*

Collective governance can therefore reproduce internal power asymmetries. Members with more time, expertise, language access, technical knowledge, wealth, social standing, or network centrality can exert disproportionate influence even under equal formal voting rules. Participation requirements can themselves create unequal costs. Conversely, institutional devices such as rotation, representation, transparent records, appeal, training, delegated specialization, or nested decision structures can redistribute practical governance capacity.

Scale introduces another challenge. Direct participation can be feasible in a small organization while larger federations require representation, delegation, specialized administration, or layered governance. The resulting problem is architectural rather than reducible to a choice between direct and representative democracy. The relevant inquiry concerns which decisions are made at which level, how authority travels across levels, how local knowledge reaches broader coordination, and how participants retain meaningful revision or contestation rights.

Proposition 21.463 (Governance-scale relation). *As collective arrangements expand in membership, spatial scope, technical complexity, or functional diversity, governance commonly requires additional layers of delegation and coordination. The generative quality of scaling depends partly on whether these layers preserve information flow, accountability, contestability, and meaningful rule-changing capacity.*

21.22.6 Community Value

Community value concerns economic significance that arises through shared relations, practices, infrastructures, identities, mutual recognition, common projects, and collective capacities. It is relevant to commons, cooperatives, and solidarity-economy initiatives because their aims can exceed distributable monetary surplus. A collectively maintained meeting place, language archive, mutual-aid network, community energy system, shared workshop, local care institution, or open knowledge resource can generate several value forms at once.

Definition 21.464 (Community-generated value). *Community-generated value* is value whose formation, persistence, accessibility, or meaning depends materially on relations among participants and on a shared institutional, cultural, infrastructural, or practical configuration that cannot be attributed adequately to isolated individual production alone.

Gui's account of relational goods and relational assets is useful here because interpersonal encounters can themselves generate economically consequential goods and relation-specific stocks that standard transaction-centered representations leave weakly specified (Gui 2000). Solidarity-economy research broadens the field further by examining associative, cooperative, and self-managed initiatives whose economic activity is linked to participation, solidarity, and attempts to democratize economic organization (Laville 2010). These traditions make visible value that can be produced through the quality and continuity of relations as well as through transferable outputs.

Proposition 21.465 (Community-value plurality). *Community-generated value can include material provision, risk sharing, access, learning, trust, recognition, belonging, collective memory, cultural continuity, political capacity, ecological stewardship, and future coordination capacity. These dimensions can be partially comparable without being reducible to one scalar measure.*

Community value should also be distinguished from community approval. A durable local practice can generate identity and continuity while imposing exclusion, hierarchy, unpaid burden, surveillance, or barriers to exit. The existence of shared meaning does not establish equitable distribution. Some participants can produce substantial relational or maintenance value while receiving weak recognition or governance power. Others can capture economic returns from collectively generated assets without proportionate contribution.

This distinction is especially important for solidarity language. Solidarity can describe a political or ethical orientation toward mutual responsibility and democratic economic organization, while observed institutions can realize that orientation unevenly. Laville's account presents solidarity economy as a diverse international movement rather than a single legal form (Laville 2010). GRE should therefore reconstruct how solidarity is institutionalized through ownership, contribution, access, governance, distribution, recognition, and relations to external markets or states rather than infer it from organizational self-description alone.

Proposition 21.466 (Community value and distribution). *The collective generation of value does not determine its distribution. Analysis should distinguish who contributes to community value, who can access it, who receives recognition or material benefit, who bears maintenance burdens, and who possesses authority over conversion or appropriation of collectively generated value.*

21.22.7 Relational Reconstruction

GRE can reconstruct commons, cooperative, and solidarity arrangements through a history-bearing architecture linking membership, resources, rights, contribution, reciprocity, governance, value, power, and future collective capacity. The gain from this reconstruction lies in connecting dimensions that the source traditions often ana-

lyze separately. Its legitimacy depends on preserving the institutional specificity that makes each tradition analytically useful.

Definition 21.467 (Collective generative architecture). *A collective generative architecture is a history-bearing configuration in which relations among membership, resources, rights, contributions, governance, recognition, and value conversion create, preserve, transform, or constrain capacities and future possibilities at both participant and collective scales.*

The first relational layer concerns membership. Collective arrangements require some account of who can enter, use, contribute, govern, benefit, leave, or represent the collective. Membership can be open, conditional, territorial, occupational, contributory, inherited, purchased, elected, or otherwise constituted. These conditions shape access to resources and voice while also defining the boundary across which solidarity, obligation, and exclusion operate.

The second layer concerns rights and contributions. Rights to use, withdraw, govern, exclude, transfer, or receive residual benefits can be distributed separately (Schlager and Ostrom 1992). Contributions can consist of labor, money, maintenance, knowledge, restraint, monitoring, care, infrastructure, risk bearing, or participation in governance. The relationship between contribution and benefit can be direct, pooled, reciprocal, redistributive, delayed, or partly independent. GRE can therefore examine the conversion interface through which heterogeneous contributions become collective capacities and through which collectively generated value returns to participants or external actors.

Proposition 21.468 (Collective conversion interface). *A collective economic arrangement contains a collective conversion interface wherever heterogeneous contributions are transformed into shared resources, services, capabilities, or relational assets and later converted into differentiated forms of access, benefit, recognition, authority, or future opportunity.*

The third layer concerns governance and power. Collective rule-making can distribute power, create countervailing capacity, and enable participants to govern resources that would otherwise be controlled externally. It can also create new internal asymmetries through agenda control, expertise, delegation, membership boundaries, or control over information. GRE's power analysis therefore asks how the collective architecture changes participants' feasible trajectories, including their capacity to contest rules, obtain alternatives, and retain meaningful exit.

The fourth layer concerns time. Collective resources and institutions commonly accumulate through repeated contribution. Trust, common knowledge, procedures, maintenance routines, reputational records, physical infrastructure, cultural meaning, and organizational competence can be history-dependent collective assets. A present transaction can draw on value generated by earlier members and can alter the conditions inherited by future participants. Commons maintenance, cooperative reserves, open-source repositories, and community institutions make this temporal relation especially visible.

Proposition 21.469 (Collective intertemporal generativity). *The generative significance of a collective arrangement depends partly on whether present use, governance, and distribution preserve or enlarge the resource, institutional, epistemic, and rela-*

tional capacities through which later participants can coordinate, revise rules, and pursue valued projects.

The fifth layer concerns relations with external systems. Commons and cooperatives rarely operate in isolation from markets, states, finance, law, platforms, supply chains, or public infrastructure. A cooperative can be democratically governed internally while remaining dependent on concentrated external finance or market access. A knowledge commons can permit open participation while relying on privately controlled hosting or computational infrastructure. A solidarity initiative can receive public support that stabilizes its mission or subjects it to external administrative constraints. Relational reconstruction therefore includes the boundary relations through which collective autonomy is enabled, conditioned, or eroded.

Proposition 21.470 (Collective autonomy as relational capacity). *Collective autonomy is best analyzed as a relational capacity to sustain and revise a collective purpose under external interdependence. It depends on alternatives, resources, knowledge, legal protections, infrastructure, bargaining position, and governance competence as well as on formal organizational independence.*

This reconstruction also clarifies GRE's concept of generative value. Commons, cooperative, and solidarity arrangements can generate value by creating future coordination capacity, preserving shared resources, circulating knowledge, maintaining trust, widening participation, or sustaining infrastructures whose benefit appears only over long horizons. Such value can coexist with ordinary market revenue or monetary surplus. The analytical task is to identify the mechanism, affected subjects, temporal horizon, and conversion pathway rather than classify collective forms as inherently generative.

Proposition 21.471 (Institutionally conditioned collective generativity). *Collective organization supports generativity under conditions in which its rules and relations enable participants to reproduce or enlarge valued capabilities and future options. Collective form alone supplies insufficient evidence because similar legal or organizational labels can support preservation, stagnation, exclusion, extraction, or transformation under different institutional conditions.*

21.22.8 Limits of Translation

The relational reconstruction creates substantial correspondence with commons, cooperative, and solidarity economics because each tradition already treats economic life as institutionally and socially constituted. Translation nevertheless encounters important limits. Shared relational vocabulary can obscure differences in analytical purpose, political commitment, legal form, resource specificity, and normative orientation. These remainders should remain visible.

Proposition 21.472 (Commons translation limit). *GRE can translate commons governance into relations among resources, rights, participants, contributions, and rules, while resource-specific institutional knowledge retains independent explanatory authority. Relational abstraction cannot determine which governance arrangement will be viable for a particular commons without domain evidence.*

Ostrom's work is especially resistant to conversion into a universal relational

prescription. Its force comes partly from comparative institutional inquiry demonstrating variation across cases, including both successful and unsuccessful self-governance (Ostrom 1990; Ostrom 2005). GRE can provide additional coordinates concerning power, heterogeneous value, generativity, and historical propagation, yet these coordinates do not substitute for empirical institutional diagnosis.

Proposition 21.473 (Cooperative translation limit). *GRE can reconstruct cooperative ownership and governance relationally while the cooperative tradition's historically articulated commitments to democratic control, member participation, autonomy, education, inter-cooperation, and community concern remain normative and institutional contents that generic relational terminology does not generate by itself.*

The same limit applies to solidarity economy. Relational analysis can describe association, participation, reciprocity, collective capacity, and value circulation. Solidarity also contains political and ethical commitments concerning democratization, mutual responsibility, and the organization of economic life (Laville 2010). Those commitments require normative argument and historical interpretation beyond the descriptive statement that relations exist.

A further translation limit concerns community. GRE can analyze community-generated value, relational assets, trust, mutual dependence, and collective identity. Community language can also conceal exclusion, internal hierarchy, coercive obligation, gendered or status-based burdens, and weak exit. Relationality therefore supplies an analytical object without conferring positive normative status. Evaluation requires attention to freedom, justice, recognition, distribution, care, and other normative dimensions developed elsewhere in the book.

Proposition 21.474 (Relationality–solidarity non-identity). *Relational density, repeated interaction, or collective organization does not establish solidarity. Solidarity refers to a more specific orientation or institutionalized practice of mutual responsibility whose presence, scope, distribution, and normative adequacy require independent evidence and argument.*

Measurement presents a final boundary. Monetary surplus, member income, resource condition, participation rates, voting records, network structure, contribution histories, and service outputs can each reveal part of a collective arrangement. Trust, recognition, belonging, informal obligation, tacit governance competence, and collective memory often require qualitative or interpretive access. Commons and cooperative research therefore reinforces Chapter 21's broader methodological pluralism: collective economic life is partially measurable through formal and quantitative indicators while remaining dependent on institutional histories and meanings that cannot be recovered from those indicators alone.

Proposition 21.475 (Collective-economic multi-method requirement). *Adequate analysis of commons, cooperative, and solidarity arrangements commonly requires several evidential modes because resource condition, formal rights, observed contribution, effective control, participant meaning, informal norms, and historical institutional development constitute distinct but interacting objects of inquiry.*

The dialogue therefore yields a bounded conclusion. Commons research contributes precise institutional analysis of shared-resource governance; cooperative economics and cooperative practice illuminate distributed ownership, member par-

ticipation, and alternative enterprise architectures; reciprocity research expands the analysis of temporally open return relations; and solidarity-economy scholarship connects economic organization to association and democratic purpose. GRE contributes a common architecture for examining how these relations interact through power, heterogeneous value, history, conversion, and future capacity. The relationship is strongest when translation remains partial: each source tradition can enrich GRE while retaining concepts, commitments, and empirical knowledge that GRE should neither absorb nor replace.

21.23 Economic Sociology and Relational Economics

This section extends the theory-specific dialogue to economic sociology, relational sociology, and relational approaches within economics. Its role is to examine traditions for which social relations, networks, fields, institutions, trust, meaning, and interaction are already constitutive analytical objects rather than external corrections to an otherwise atomized economy. The objective is therefore different from the preceding translations. The discussion reconstructs embeddedness, networks, social fields, relational goods, institutions, and trust; it then develops a GRE relational reconstruction, identifies substantive points of proximity, and specifies limits of identification. The method is comparative, sociological, institutional, and conceptual. It treats relational analysis as a heterogeneous intellectual field and avoids attributing to GRE insights that are already well developed in economic sociology and relational scholarship. Table 21.23 summarizes the principal dialogue coordinates.

Definition 21.479 (Relationally constituted economic action). *Relationally constituted economic action* is economic action whose feasible forms, meanings, expected consequences, or realized effects depend materially on the actor's ongoing relations, positions, institutional memberships, or socially organized interpretive environment.

This definition establishes a broad comparative object rather than a proprietary GRE category. Granovetter's account of embeddedness challenged explanations based on atomized action by locating economic conduct within ongoing social relations (Granovetter 1985). Network sociology has developed formal and interpretive approaches to positions, roles, ties, clusters, and dependencies (Wellman 1983; White et al. 1976; White 2008). Bourdieu's relational sociology and later field approaches place positions, structured struggle, capital, and mesolevel orders at the center of analysis (Bourdieu and Wacquant 1992; Fligstein and McAdam 2012). Relational-goods scholarship studies forms of value whose realization depends on interaction or shared relational experience (Uhlener 1989; Gui 2000; Donati 2019). Zelizer's relational work further shows that differentiated social relations are actively matched with economic transactions, media, boundaries, and meanings (Zelizer 2012).

Proposition 21.480 (Prior relational scholarship condition). *A GRE dialogue with economic sociology should treat relational constitution, embeddedness, network position, field structure, relational value, and socially organized meaning as established bodies of inquiry whose concepts require attribution and comparison before any GRE extension is proposed.*

21.23.1 Embeddedness

Embeddedness provides the first coordinate because it directly challenges the analytical isolation of economic action from ongoing social relations. Granovetter's formulation positioned economic conduct between undersocialized and oversocialized accounts: actors neither choose within a social vacuum nor simply enact a fully internalized social script. Concrete interpersonal relations, histories, and network structures can shape information, opportunity, enforcement, reputation, and the practical conditions of exchange (Granovetter 1985). This insight gives economic sociology one

Table 21.23: Relational coordinates for economic sociology and relational economics

Coordinate	Established relational object	Dialogue boundary
Embeddedness	Economic action situated within ongoing social and institutional relations	Use of embeddedness as a generic synonym for contextual influence without specifying the relevant relation or mechanism
Networks	Patterned ties, positions, roles, brokerage, closure, dependence, and multi-network structure	Identification of graph representation with the full social relation or with causal mechanism
Social fields	Positionally organized domains with stakes, rules, resources, power, interpretation, and structured interaction	Equation of field with network topology or with GRE field language independent of theory-specific assumptions
Relational goods	Goods or benefits whose realization depends constitutively on interaction, shared identity, or the relationship itself	Merger of distinct rational-choice, interpersonal, and relational-sociological formulations into one category
Institutions	Rules, classifications, conventions, organizational fields, meanings, and stabilized expectations shaping action	Reduction of institutions to external constraints or presumption that institutional persistence establishes efficiency or legitimacy
Trust	Relation-sensitive expectations and vulnerabilities affecting exchange, cooperation, information, and collective action	Equation of trust with reputation, compliance, familiarity, social capital, or moral virtue
GRE reconstruction	History-bearing relations whose configuration alters value, capability, power, knowledge, and later possibility	Attribution of established sociological insights to GRE or translation of sociological specificity into generic relational vocabulary
Analytical proximity	Shared rejection of strongly atomized explanation and shared attention to constitutive relations	Identity inferred from common relational language despite differences in questions, methods, ontology, and evaluative purpose

of its clearest interfaces with GRE.

Definition 21.481 (Relational embeddedness). *Relational embeddedness* is the condition under which an economic action, transaction, organization, or expectation depends materially on ongoing social relations whose history and structure affect the feasible or interpreted form of the economic process.

Embeddedness should nevertheless be specified rather than invoked as a general statement that society matters. A labor contract may be embedded in professional networks, migration status, family obligations, sectoral conventions, labor law, and workplace hierarchy. A credit relation may depend on kinship, reputation, collateral

institutions, community knowledge, and prior transactions. A firm's procurement decision may be conditioned by repeated interorganizational ties, technical standards, regulatory relations, and local political arrangements. These forms of embeddedness can reinforce one another or create conflicting pressures.

Polanyi's broader treatment of the economy as an instituted process provides a different but related lineage. His analysis emphasizes institutional patterns such as reciprocity, redistribution, and exchange and rejects the treatment of market exchange as the transhistorical form of economic integration (Polanyi 1957). Granovetter's network-centered formulation and Polanyi's institutional-historical formulation therefore share an anti-atomizing impulse while operating at different analytical scales.

Proposition 21.482 (Embeddedness specification condition). *A claim of economic embeddedness should identify the relevant relation, institution, network, or historical configuration and state the mechanism through which it changes information, incentives, meaning, access, enforcement, power, or another specified economic outcome.*

Embeddedness can enable and constrain simultaneously. Dense relations can support reputation, cooperation, knowledge transfer, and informal enforcement. The same density can restrict entry, intensify conformity, facilitate collusion, reproduce discrimination, or shield insiders from external scrutiny. The evaluative consequences therefore depend on whose relations are stabilized, who is excluded, what information circulates, and which forms of conduct the relational configuration makes easier or harder.

Temporal depth is equally important. A current tie carries traces of earlier interaction, remembered performance, inherited status, and prior institutional change. The same formally specified transaction can therefore operate differently when embedded in relations with different histories. This provides a direct bridge to GRE's emphasis on history-bearing relations while leaving the original sociological insight intact.

Proposition 21.483 (Embedded-history condition). *Where prior interaction materially changes present economic conduct, the relevant analytical object includes the history through which expectations, reputation, obligations, meanings, and asymmetries were formed.*

Embeddedness also has a boundary problem. Researchers select which relations count as relevant. Expanding the contextual boundary indefinitely eventually dissolves explanation into an unbounded inventory of social influence. A useful relational analysis therefore requires a target-relative boundary: the included relations are those for which plausible mechanisms and evidence connect them to the economic process under study.

21.23.2 Networks

Networks provide the second coordinate because they make patterned relations directly observable and analyzable. Network analysis shifts attention from aggregated attributes toward ties, positions, paths, clusters, structural equivalence, brokerage, closure, and dependence. Wellman's structural perspective emphasizes patterned re-

lations and network position, while White, Boorman, and Breiger show how roles and positions can be reconstructed from multiple networks rather than assigned solely from actor attributes (Wellman 1983; White et al. 1976).

Definition 21.484 (Economic network representation). An *economic network representation* specifies a set of nodes, one or more types of relations among them, and the temporal or contextual conditions under which those relations are recorded for an economic research question.

The definition emphasizes representation. A graph can encode buyer–supplier relations, collaboration, advice, ownership, credit, migration, friendship, membership, or several layers simultaneously. The interpretation of an edge depends on what relation it represents, how it was measured, whether it is directed or reciprocal, how long it persists, and what activity can pass through it. Network structure can therefore illuminate relational organization while remaining selective.

Multiple networks often matter at once. Persons can be connected through employment, kinship, friendship, finance, professional membership, or shared institutions. Organizations can be linked through ownership, contracts, personnel mobility, standards, research collaboration, and political association. Breiger’s analysis of the duality of persons and groups illustrates how membership relations connect interpersonal and intergroup structure (Breiger 1974). White’s later relational sociology extends the analysis toward identities, control efforts, meaning, and emergent social formations (White 2008).

Proposition 21.485 (Network mechanism condition). A *network association becomes an economic explanation only when the analysis identifies a mechanism through which the represented tie or position affects information, access, dependence, coordination, bargaining, diffusion, learning, enforcement, recognition, or another specified process.*

This requirement guards against equating centrality with power, density with trust, or connectivity with beneficial access. A centrally located actor may possess brokerage opportunities while facing heavy obligations. Dense networks can facilitate coordination while reducing exposure to outside information. Sparse bridging ties can widen access while creating dependence on a small number of intermediaries. The direction and distribution of effects require substantive interpretation.

Networks can also be generative. Interorganizational collaboration can create channels for learning and innovation; Powell’s work on network forms and biotechnology collaborations provides well-established examples of economic coordination and learning beyond a simple market–hierarchy dichotomy (Powell 1990; Powell et al. 1996). From a GRE perspective, the question is then whether a network relation merely transmits existing resources or also changes participants’ later capacities, identities, knowledge, or feasible relations.

Definition 21.486 (Network-generative effect). A *network-generative effect* occurs when participation in a network relation or position materially changes the set of relations, capabilities, resources, knowledge, or organizational possibilities available in subsequent periods.

This concept is a GRE extension rather than a replacement for network analysis. Network methods remain especially strong for specifying structure, while generative analysis asks an additional temporal question about what the structure produces or

makes possible later.

21.23.3 Social Fields

Social fields provide the third coordinate because some economic relations are intelligible only within positionally organized domains possessing stakes, recognized resources, rules, categories, and structured relations of power. Field approaches therefore move beyond isolated dyads while retaining mesolevel organization. Bourdieu and Wacquant develop a relational sociology centered on fields, forms of capital, habitus, position, and struggle (Bourdieu and Wacquant 1992). Fligstein and McAdam conceptualize strategic action fields as mesolevel social orders containing incumbents, challengers, governance units, shared understandings, and relations with other fields (Fligstein and McAdam 2012).

Definition 21.487 (Economic social field). An *economic social field* is a bounded-for-analysis domain in which actors or organizations occupy differentiated positions and orient action partly through field-specific stakes, resources, rules, classifications, expectations, and relations of power.

Field analysis differs from network analysis. Networks represent patterns of specified ties; fields can additionally include recognized stakes, categorical distinctions, symbolic valuation, rules of membership, authority, and position-dependent interpretation. Two actors may occupy proximate field positions without maintaining a direct tie, and the same network tie can carry different significance when participants occupy different field positions.

Power is therefore internal to field reconstruction. Positions can differ in access to valued resources, authority to define legitimate practice, capacity to set standards, visibility, or ability to shape the terms of competition. Bourdieu's relational method is especially important because it treats positions and forms of capital in relation to the structured space in which they acquire efficacy (Bourdieu 1977; Bourdieu and Wacquant 1992). Fligstein and McAdam similarly distinguish incumbents and challengers and emphasize field stability, crisis, and transformation (Fligstein and McAdam 2012).

Proposition 21.488 (Field-position condition). *Claims about an economic actor's field position should specify the field boundary, relevant stakes, position-defining relations or resources, and the mechanisms through which position affects action or outcome.*

Fields are also nested and intersecting. A firm can participate simultaneously in a product market, profession, regulatory domain, financial field, technological community, and political environment. Changes in one field can alter resources or classifications in another. The resulting cross-field movement creates an important interface with GRE's interest in value conversion and relational transformation, although the theoretical vocabularies remain distinct.

Field boundaries are often objects of struggle rather than fixed containers. Actors may contest who counts as a legitimate participant, what forms of capital are recognized, which standards define quality, or which transactions belong inside a regulated domain. Boundary change can therefore redistribute both material opportunities and symbolic standing.

Proposition 21.489 (Field-boundary endogeneity). *Where actors can contest membership, classification, stakes, or legitimate resources, the field boundary should be modeled as historically produced and potentially transformable rather than treated as an exogenous analytical constant.*

GRE's own use of field language should remain disciplined by these distinctions. A GRE relational field is a target-relative representation of distributed conditions and relations; it should not be identified automatically with a Bourdieusian field, a strategic action field, or an organizational field. The correct translation depends on the research question and on which theoretical commitments the analysis actually requires.

21.23.4 Relational Goods

Relational goods provide the fourth coordinate because they challenge accounts in which value can be assigned independently of the interaction through which it is realized. The literature contains several formulations. Uhlaner develops an early rational-choice account in which sociability and participation can generate goods dependent on interaction or shared identity (Uhlaner 1989). Gui treats interpersonal encounters as productive processes capable of generating relational goods and relation-specific assets (Gui 2000). Donati develops a stronger relational-sociological conception in which the relationship itself can emerge as a good realized through sharing (Donati 2019).

Definition 21.490 (Relational-good family). The *relational-good family* comprises theories in which some economically or socially relevant benefit depends constitutively on interaction, shared participation, or the quality of a relation and therefore cannot be represented adequately as an independently possessed object without specifying that relational condition.

The plural term “family” is important because the theories differ. A relational good can be represented as an interaction-dependent payoff within rational action, as an interpersonal output jointly produced during an encounter, or as an emergent property of the relationship itself. These positions have different ontological and methodological commitments. Translation should preserve those differences.

Relational goods also make visible a distinction between a resource that enables relations and a good constituted in relation. A public meeting space can enable sociability without being identical to the friendship, trust, recognition, or shared experience produced there. An interoperable digital standard can enable cooperation while remaining an infrastructure rather than the relation itself. This distinction is relevant to GRE's earlier category of public relational goods, which includes enabling institutional and infrastructural conditions and therefore has a wider scope than some relational-goods theories.

Proposition 21.491 (Relational-value constitution condition). *Where the value of an outcome depends on the relationship through which it is produced or experienced, evaluation should preserve that constitutive relational condition rather than represent the outcome solely as an individually possessed quantity.*

Relational value can be heterogeneous and asymmetric. The same interaction can

provide belonging or recognition to one participant while imposing emotional labor, surveillance, status obligation, or dependency on another. A family meal, community event, cooperative workplace, or service encounter can generate relational benefits without distributing them equally. The language of relational goods therefore requires an incidence analysis comparable to that used for other economic values.

Definition 21.492 (Relational-value incidence). *Relational-value incidence* is the distribution of benefits, burdens, recognition, obligations, and future relational consequences generated through a specified interaction or relationship among participants and other affected parties.

This creates another interface with GRE. A relation can generate value in the present and also alter later opportunities by creating trust, identity, knowledge, obligation, exclusion, or institutional continuity. GRE adds this temporal generative question while leaving the relational-goods literature as an independent source for understanding value constituted through interaction.

21.23.5 Institutions

Institutions provide the fifth coordinate because economic sociology treats economic conduct as organized through rules, classifications, conventions, organizational fields, cultural meanings, and stabilized expectations. This perspective overlaps with institutional economics while often placing greater emphasis on legitimacy, social meaning, organizational environment, and the production of categories. DiMaggio and Powell's analysis of organizational fields, for example, identifies coercive, mimetic, and normative processes capable of producing organizational similarity beyond direct efficiency selection (DiMaggio and Powell 1983).

Definition 21.493 (Sociological institutional configuration). A *sociological institutional configuration* is a historically stabilized arrangement of rules, classifications, norms, organizations, expectations, and legitimating meanings that structures economic action within a specified domain.

The concept should not imply that institutions are wholly external to actors. Institutions are reproduced, interpreted, enacted, and sometimes contested through practice. Organizational members can comply selectively, reinterpret categories, create informal routines, or mobilize alternative standards. Institutionalization therefore describes a degree and mode of stabilization rather than an immutable structure.

Economic categories themselves can be institutionally produced. What counts as employment, ownership, creditworthiness, professional competence, a legitimate firm, an eligible beneficiary, or a recognized transaction depends partly on classification systems and authoritative procedures. Such categories have material effects because they govern access, obligations, visibility, and enforceability. GRE's manifestation layer provides one vocabulary for studying these representations, but economic sociology supplies richer accounts of how categories acquire legitimacy and social force.

Proposition 21.494 (Institutional category condition). *When an economic outcome depends on a classification, status, credential, or organizational category, analysis should examine the institutions that produce, recognize, enforce, and contest that*

category in addition to measuring the category's downstream effects.

Institutions also organize relations between formally separate organizations. Regulatory systems, professional associations, standards bodies, funding arrangements, rankings, and shared cultural models can create common expectations across organizational fields. Direct contractual ties therefore capture only part of the institutional environment.

Zelizer's relational-work perspective adds a particularly important correction to overly rigid institutional accounts. Economic and intimate relations are not simply separated into distinct spheres; people actively differentiate relations and match them with transactions, media, boundaries, and meanings (Zelizer 2012). The institutional question consequently includes how actors maintain distinctions among kinds of relations and what happens when the matching becomes contested.

Definition 21.495 (Institutional relation matching). *Institutional relation matching* is the socially organized process through which participants connect a type of relationship with recognized transactions, media, boundaries, obligations, or evaluative meanings.

This concept is especially useful for GRE because conversion across value forms often occurs through institutionally organized interfaces. Money, credentials, rankings, legal statuses, and organizational procedures can translate one kind of contribution into another kind of recognized claim. Economic sociology helps prevent GRE from treating these conversions as purely technical mappings by showing that the categories and boundaries themselves are socially constituted.

21.23.6 Trust

Trust provides the sixth coordinate because many economic relations involve incomplete information, vulnerability, deferred performance, and limited control over counterpart behavior. Arrow identifies trust and related social virtues as economically consequential for exchange (Arrow 1972). Coleman treats obligations, expectations, information channels, norms, and closure as forms of social capital embedded in social structure (Coleman 1988). Ostrom's work on collective action further emphasizes feedback among trust, reciprocity, and reputation in sustaining cooperation (Ostrom 1998).

Definition 21.496 (Economic trust relation). An *economic trust relation* is a relation in which one party accepts material, informational, organizational, or social exposure partly on the expectation that another party or institution will act within an anticipated range despite incomplete control or verification.

Trust should be distinguished from several neighboring concepts. Reputation concerns socially available information or beliefs about prior conduct. Familiarity concerns repeated exposure. Compliance concerns observed conformity with a rule. Confidence can arise from institutional safeguards that reduce vulnerability. Social capital can include trust while also encompassing obligations, norms, information channels, and network structure. Empirical research should therefore specify which object is being measured.

Proposition 21.497 (Trust-object specification). *A claim about trust should identify*

the trusted party or institution, the relevant domain of conduct, the exposure accepted by the trusting party, and the evidential basis for inferring trust rather than reputation, familiarity, compliance, or institutional assurance.

Trust can reduce some transaction and monitoring burdens, facilitate knowledge sharing, support delayed reciprocity, and enable cooperation under uncertainty. It can also generate vulnerability. Trust placed in unreliable or predatory actors can magnify harm, while dense trust within an insider group can support exclusion or collusion toward outsiders. High internal trust therefore does not establish social desirability.

Power further complicates the relation. A dependent worker, borrower, patient, platform participant, or migrant may continue a relation while reporting or displaying cooperative behavior because exit is costly. Observed compliance in such settings should not be interpreted automatically as trust. Conversely, institutional protections can support cooperation among strangers by limiting exposure and providing remedies when trust fails.

Proposition 21.498 (Trust–power distinction). *Observed relational continuity or cooperative conduct should not be treated as evidence of trust when dependence, coercion, lack of alternatives, or asymmetric control provides a plausible alternative mechanism.*

Trust can become generative when it changes what participants can undertake together. A history of reliable collaboration can support more complex projects, longer time horizons, shared investment, or reduced duplication of verification. Broken trust can contract future options by increasing monitoring costs, reducing willingness to share information, or fragmenting networks. This temporal dimension provides a natural bridge to GRE.

Definition 21.499 (Trust-mediated generativity). *Trust-mediated generativity* occurs when a trust relation materially changes the later set of feasible collaborations, exchanges, investments, or information-sharing arrangements available to participants.

21.23.7 Relational Reconstruction

The preceding coordinates permit a GRE reconstruction centered on a history-bearing architecture of economic relations. Economic action is situated within networks, fields, institutions, categories, meanings, and trust relations that condition what actors can perceive, value, access, exchange, and become. GRE can connect these elements by asking how their configuration changes later capabilities, relations, value-conversion pathways, distributions of power, and future possibilities. The reconstruction remains an extension of established relational scholarship rather than a claim to have originated relational economic analysis.

Definition 21.500 (History-bearing economic relational architecture). A *history-bearing economic relational architecture* is a temporally evolving configuration of actors, relations, positions, institutions, meanings, representations, resources, and power whose prior development materially conditions present economic action and whose current operation can alter later feasible relations and capacities.

The first element is relation formation. Economic relations do not arise from op-

portunity sets alone. Entry can depend on referrals, credentials, institutional membership, language, geographic proximity, prior reputation, platform access, or social recognition. These conditions determine who can encounter whom and under what terms. Allocation to relationship-forming infrastructure can therefore alter the future network itself.

Proposition 21.501 (Relation-formation generativity). *A present allocation or institutional change is relationally generative when it materially changes which economically consequential relations can form, persist, dissolve, or become accessible in subsequent periods.*

The second element is position. Network and field positions influence access to information, brokerage, legitimacy, resources, and bargaining leverage. GRE adds a temporal question: how does occupying a position change the actor's later capabilities and the structure available to others? A prestigious institutional affiliation can generate additional invitations and credentials; a peripheral position can reproduce exclusion by limiting access to relation-forming opportunities.

The third element is meaning. Zelizer's relational work shows that economic transactions are matched with socially differentiated relations and meanings (Zelizer 2012). GRE's manifestation layer can model the categories through which these relations become legible, while remaining dependent on sociology and historical inquiry to establish what those categories mean in practice. A payment can signify wage, gift, compensation, contribution, care, debt repayment, or honorarium depending on the relation and institution in which it occurs.

Proposition 21.502 (Relational meaning condition). *An economic transfer should be interpreted through the relation, institutional category, and social meaning that organize it whenever those features materially affect rights, expectations, valuation, or subsequent interaction.*

The fourth element is relational value. Interaction can generate trust, recognition, belonging, shared competence, identity, or obligations whose value cannot always be separated from the relation itself. GRE can place such value alongside material, capability, institutional, ecological, epistemic, and symbolic value without presuming commensurability. Conversion among these forms is itself relational: a professional network can convert recognition into employment opportunity; a credential can convert institutional classification into access; trust can convert prior reliable interaction into reduced verification burdens.

The fifth element is power. Relations can distribute the capacity to define categories, set terms of exchange, control access to networks, certify membership, govern data, allocate recognition, or determine which relational value becomes economically convertible. Economic sociology's field and institutional traditions help make these mechanisms concrete. GRE can then trace how current asymmetries propagate through future relation formation and value conversion.

Definition 21.503 (Relational conversion power). *Relational conversion power is the capacity, grounded in a specified economic relation or position, to influence whether and how another participant's resources, status, recognition, contribution, or relational value becomes convertible into an economically consequential claim or opportunity.*

The sixth element is recursive transformation. Economic relations can alter the subjects and institutions participating in them. Collaboration can create shared vocabularies and identities; market participation can reshape organizational routines; repeated classification can influence self-understanding; exclusion can redirect affiliation; and institutional reform can change what kinds of relationships are recognized. This recursion is a central point at which GRE's generative orientation extends established relational analysis.

Proposition 21.504 (Relational recursion condition). *Where participation in an economic relation changes the actors, categories, institutions, or relation-forming capacities that structure later interaction, the relation should be analyzed as a recursive transformation rather than as a fixed channel connecting unchanged entities.*

21.23.8 Analytical Proximities among Relational Traditions

Economic sociology, relational sociology, relational economics, and GRE possess substantial analytical proximity. The purpose of identifying that proximity is comparative clarification rather than disciplinary assimilation. Several shared orientations explain why translation can be unusually strong in this domain.

The first proximity is resistance to strongly atomized explanation. Granovetter's embeddedness thesis, network analysis, field theory, and relational sociology all treat the relations among actors as explanatory rather than incidental (Granovetter 1985; Wellman 1983; Emirbayer 1997). GRE shares this orientation and extends it toward the downstream production of later possibilities.

The second proximity concerns endogenous social structure. Networks, fields, institutions, and identities can emerge, stabilize, and transform through interaction. White's account of identity and control and Fligstein and McAdam's field theory exemplify social formations that cannot be reduced cleanly to fixed individual attributes (White 2008; Fligstein and McAdam 2012). GRE likewise treats subjects and structures as potentially history-bearing and transformable.

The third proximity concerns meaning. Economic sociology has long resisted the view that transactions possess economically relevant meaning independently of their social classification. Zelizer's relational-work approach is especially close to GRE's interest in heterogeneous value and conversion because it examines the matching among relations, transactions, media, boundaries, and meanings (Zelizer 2012). GRE benefits from this literature by avoiding an overly structural account of relations.

The fourth proximity concerns multiple levels of organization. Dyadic relations, networks, organizations, fields, institutions, and broader historical structures can interact. Relational sociology supplies mature concepts for moving across these levels without assuming that one scale exhausts explanation. GRE's multiscale and generative-spacetime language can complement this work when the research question requires explicit temporal propagation.

Proposition 21.505 (Relational-proximity condition). *Conceptual proximity between GRE and an established relational tradition should be stated at the level of the shared analytical object or mechanism and should not be extended automatically to ontology, method, normative commitments, or explanatory scope.*

The fifth proximity concerns power and position. Bourdieu's fields, network dependence, institutional classification, and boundary work all show that relations are structured by unequal capacities and differentiated positions. GRE's power framework can translate some of these asymmetries into effects on future capability, conversion, and relation formation while remaining dependent on the originating theories for their historically specific mechanisms.

The sixth proximity concerns relational value. Uhlaner, Gui, and Donati offer distinct theories in which value depends on interaction or the relation itself (Uhlaner 1989; Gui 2000; Donati 2019). GRE's heterogeneous-value framework can accommodate such value while asking additional questions about circulation, dissipation, capture, regeneration, and conversion. The proximity is therefore substantive, yet equivalence remains partial.

Definition 21.506 (Relational theoretical proximity). *Relational theoretical proximity* is a partial correspondence between theories in which one or more analytical objects, mechanisms, or explanatory commitments overlap sufficiently to support translation while other theoretical commitments remain distinct.

This definition is useful beyond the present section. Theories can be close enough for productive dialogue without being variants of one framework. Indeed, the strongest value of dialogue may arise precisely when neighboring theories illuminate different dimensions of the same relational configuration.

21.23.9 Limits of Identification

The proximity between GRE and relational traditions creates a special risk: concepts can appear so similar that translation is mistaken for identity. This subsection therefore specifies the principal boundaries that should remain visible.

The first boundary concerns intellectual priority. Embeddedness, network position, social fields, relational goods, institutional classification, trust, and relational meaning all have substantial literatures predating GRE. GRE can reorganize some of these insights within a generative research programme, but reorganization does not establish conceptual priority. Attribution is part of theoretical discipline.

Proposition 21.507 (Relational priority condition). *When a GRE concept overlaps materially with an established relational concept, the manuscript should identify the prior literature and state the narrower feature introduced by the GRE formulation rather than treating relationality itself as the innovation.*

The second boundary concerns ontology. Emirbayer's relational sociology explicitly contrasts substantialist and relational modes of thought, while Bourdieu's field theory, White's network sociology, and Donati's relational sociology carry their own commitments about the status of relations, positions, identities, or emergent relational goods (Emirbayer 1997; Bourdieu and Wacquant 1992; White 2008; Donati 2019). GRE maintains ontological suspension. Similar vocabulary therefore does not warrant importing another theory's ontology into GRE without argument.

The third boundary concerns representation. A network is one representation of selected relations; a field is a theory-laden mesolevel structure; a relational good is a value concept; embeddedness is an explanatory orientation; trust is a relational ex-

pectation under exposure. These objects operate at different analytical levels. Calling each of them “relational” does not make them interchangeable.

Proposition 21.508 (Relational-category non-equivalence). *Network, field, institution, embeddedness, trust, relational good, and GRE relation should remain distinct categories unless the research design establishes a specific mapping among them.*

The fourth boundary concerns method. Economic sociology employs ethnography, interviews, archival work, network analysis, organizational research, surveys, experiments, comparative history, and formal models. Relational economics similarly spans several methodological styles. GRE’s methodological pluralism can accommodate these approaches, but it does not supply their evidential warrants. A relational claim remains dependent on the method appropriate to the phenomenon under study.

The fifth boundary concerns normativity. Relations can produce trust, cooperation, belonging, and mutual benefit; they can also organize domination, exclusion, dependency, discrimination, surveillance, and collusion. Relational density or persistence therefore has no automatic positive normative status. The same caution applies to relational goods: the presence of interaction-dependent value does not settle questions of fairness, consent, recognition, distribution, or external effects.

Proposition 21.509 (Relational normative neutrality). *The existence, density, persistence, or generativity of an economic relation does not by itself establish the relation’s justice, desirability, legitimacy, or welfare value.*

The sixth boundary concerns generativity. Economic sociology already studies emergence, reproduction, institutionalization, diffusion, path dependence, learning, identity formation, and social change. GRE’s distinctive contribution cannot therefore consist in the observation that relations have consequences through time. Its narrower contribution lies in making the downstream production, preservation, contraction, and redistribution of future capabilities and relational possibilities a systematic economic object across heterogeneous value domains.

Definition 21.510 (GRE generative remainder). *The GRE generative remainder in dialogue with relational economic traditions is the explicit analytical focus on how present relational configurations alter the distribution and structure of later feasible relations, capabilities, value-conversion pathways, and open possibilities across specified timescales.*

Even this remainder should be stated modestly. Particular sociological theories may already analyze some or all of these dynamics. The GRE contribution is architectural: it places them within a shared economic research programme and connects them systematically to heterogeneous value, allocation, power, epistemic mediation, and future option structures.

The seventh boundary concerns disciplinary purpose. Economic sociology can explain how markets, organizations, classifications, identities, and transactions are socially constituted without adopting an economic-theory programme. Relational economics can pursue welfare, participation, interpersonal value, or institutional questions using its own conceptual commitments. GRE seeks to build an economic research programme around generative relational questions while retaining interfaces with sociology, law, political theory, ecology, education, AI studies, and other

domains. These purposes overlap without collapsing into one discipline.

Proposition 21.511 (Economic-sociology–GRE non-identity). *Strong overlap in relational objects supports extensive dialogue between economic sociology, relational economics, and GRE while leaving disciplinary history, ontology, method, normative purpose, and the systematic focus on future generative consequences analytically distinct.*

The domain of adequacy is therefore complementary. Economic sociology is especially powerful where economic action depends on social structure, networks, institutions, fields, categories, culture, meaning, status, or trust. Network and field approaches provide mature tools for relational position and mesolevel organization. Relational-goods scholarship clarifies forms of value constituted through interaction. GRE can integrate these insights into a wider account of historical relational transformation and future possibility, while those established traditions constrain GRE against rediscovering relational insights under new terminology. The dialogue is strongest when theoretical proximity increases mutual intelligibility without erasing intellectual difference.

21.24 Digital, Platform, and Data-Centered Economic Analysis

This section extends the theory-specific dialogue to digital economics, platform economics, data-centered analysis, and adjacent research on algorithmic coordination and digitally mediated work. Its role is to examine economic arrangements in which software interfaces, data infrastructures, ranking and matching systems, network effects, and digitally organized control become material components of coordination. The objective is to distinguish the principal economic objects made visible by these literatures and then assess their relation to GRE without treating digital mediation as a single mechanism. The discussion proceeds through platforms, data, network effects, attention, algorithmic intermediation, digital labor, and rent and control before developing a relational reconstruction and specifying limits of translation. The method is comparative, institutional, and mechanism-centered. It draws on platform and digital-economics research, organizational analysis of algorithmic control, information economics, and selected political-economic interpretations while preserving differences among those traditions. Table 21.24 summarizes the principal dialogue coordinates.

Digital economics provides an important starting point because digitization can alter several economically consequential costs at once. Goldfarb and Tucker identify reductions in search, replication, transportation, tracking, and verification costs as recurring mechanisms through which digital technologies reorganize economic activity (Goldfarb and Tucker 2019). Platform economics adds a distinct coordination problem: participation and pricing on one side of a platform can affect participation and value on another, so the economic object includes cross-side relations rather than a single buyer–seller exchange (Rochet and Tirole 2003). Data-centered analysis further expands the object by making large-scale observation, inference, experimentation, and prediction part of economic organization (Einav and Levin 2014). These developments overlap, yet each foregrounds a different mechanism.

Definition 21.512 (Digital economic mediation). *Digital economic mediation* is the organization of economically consequential interaction through computational interfaces, data structures, software rules, or communication infrastructures that condition access, visibility, matching, exchange, evaluation, coordination, or control.

Definition 21.512 identifies a broad comparative object. Digital mediation can occur in a commercial platform, a public data infrastructure, an internal organizational system, a labor-management application, a payment network, or a distributed technical standard. The category therefore concerns the mechanism through which interaction is organized rather than the legal identity of the organization operating it.

Proposition 21.513 (Digital mechanism differentiation). *Analysis of a digital economy should distinguish cost reduction, cross-side coordination, data generation, network effects, attention allocation, algorithmic intermediation, labor organization, and control over bottleneck resources because these mechanisms can vary independently and can produce different economic consequences.*

Table 21.24: Relational coordinates for digital, platform, and data-centered economic analysis

Coordinate	Established analytical object	Dialogue boundary
Platforms	Multi-sided coordination through shared interfaces, rules, pricing, standards, and participation structures	Identification of every digital service with a platform or treatment of platform mediation as a neutral container
Data	Recorded, inferred, linked, and reusable representations generated through economic and social activity	Equation of data volume with knowledge, value, accuracy, or legitimate control
Network effects	Participation value conditioned by installed base, compatibility, complementarity, or cross-side participation	Inference of monopoly, welfare, or permanence directly from the existence of a network effect
Attention	Scarce orientation and visibility allocated among abundant informational objects	Equation of exposure with preference, belief, consent, or realized demand
Algorithmic intermediation	Computational ranking, matching, pricing, scheduling, moderation, prediction, and evaluation	Treatment of an algorithm as an autonomous institution independent of rules, objectives, data, operators, and review procedures
Digital labor	Work whose tasks, access, evaluation, coordination, or output are materially mediated by digital systems	Merger of automation, platform work, remote work, content production, and data-producing activity into one labor mechanism
Rent and control	Returns and bargaining advantages associated with scarce interfaces, assets, standards, rights, or dependency positions	Classification of every digital profit as rent or every concentration outcome as the product of one control mechanism
GRE reconstruction	History-bearing digital relations connecting mediation, data, attention, labor, power, value, and later possibility	Attribution of established platform or digital-economics insights to GRE or reduction of technological specificity to generic relational language

21.24.1 Platforms

Platforms provide the first coordinate because they organize interaction among participant positions through a shared technical and institutional architecture. In two-sided market analysis, the participation of one group can affect the value received by another, and the structure of prices can matter independently of the aggregate price level (Rochet and Tirole 2003). A payment network, marketplace, operating system, labor-matching service, application store, or advertising-supported service can therefore require coordinated decisions across several participant groups. The platform becomes part of the economic mechanism through which those groups become

mutually accessible.

Definition 21.514 (Platform coordination position). *A platform coordination position is an institutional and technical position from which an actor or organization can set or implement interfaces, participation conditions, standards, pricing structures, ranking rules, or exchange pathways that coordinate interactions among two or more participant groups.*

The definition focuses on a position rather than a firm category. A cooperative, public authority, private corporation, open-source foundation, or federated consortium can operate platform-like coordination. Conversely, a digital firm that provides a single service without materially organizing interaction among distinct participant positions may fit poorly within multi-sided platform analysis. Analytical precision therefore requires specification of who interacts, through which interface, and under whose rules.

Platform coordination can create value by lowering search costs, standardizing exchange, supplying identity or reputation systems, enabling payments, reducing verification burdens, and supporting complementary innovation. These functions can enlarge the set of feasible transactions. They can also make continued participation depend on a particular interface, technical standard, reputation system, installed user base, or access rule. The same coordination architecture can consequently create capability and dependency at once.

Proposition 21.515 (Cross-side coordination condition). *A platform claim based on multi-sided interaction should identify the relevant participant sides and specify how participation, pricing, quality, visibility, or another condition on one side changes incentives or feasible interaction on another.*

Srnicsek's account of platform capitalism places these coordination functions within a broader political economy of data extraction, network effects, infrastructural positioning, and capitalist accumulation (Srnicsek 2016). That account and formal two-sided market theory operate at different levels. The former asks how platforms function as organizational forms within contemporary capitalism; the latter models coordination and price structure across participant groups. Their partial overlap supports dialogue while preserving their distinct explanatory objects.

Proposition 21.516 (Platform-role differentiation). *A platform should be analyzed through the roles it actually performs—for example matching, payment, hosting, ranking, identity, rule enforcement, data processing, or infrastructure provision—because different roles generate different dependencies and governance questions.*

This role-based approach also avoids equating scale with a single economic effect. A large installed base may increase matching quality, complement availability, or interoperability. It may also raise switching costs or make exclusion more consequential. The evaluative result depends on the mechanisms connecting scale to participant opportunities, costs, and alternatives.

21.24.2 Data

Data-centered economic analysis expands the object of inquiry from transactions to the traces, records, measurements, classifications, and inferred variables produced

through economic activity. Einav and Levin emphasize the growing availability of large, granular, and timely datasets generated by administrative and private-sector systems and the resulting possibilities for economic measurement and research (Einav and Levin 2014). Digital systems also lower the costs of tracking and verification, making recurrent observation part of ordinary economic organization (Goldfarb and Tucker 2019).

Definition 21.517 (Economic data relation). *An economic data relation is a structured relation among data-generating activities, represented subjects or objects, collection mechanisms, storage and linkage systems, access rights, analytic procedures, decision uses, and downstream consequences.*

The relational formulation matters because data rarely arise as detached resources. Transaction records depend on a payment system and its categories; mobility data depend on devices and location infrastructures; platform engagement data depend on interface design and available actions; employment metrics depend on task definitions and monitoring systems. Dataset construction therefore involves prior institutional and technical decisions about what becomes recordable and how observations are classified.

Data can be copied and recombined at low marginal cost, yet economically useful data can remain scarce because collection access, provenance, linkage rights, timeliness, coverage, exclusivity, legal permissions, or complementary analytic capacity are scarce. The information-economics tradition has long emphasized that information differs from ordinary rival goods and that appropriation can be difficult under some conditions (Arrow 1962). Digital infrastructures alter the practical forms of those problems without eliminating them.

Proposition 21.518 (Data provenance condition). *An economic claim based on data should preserve the relation between the dataset and the processes through which observations were generated, selected, classified, transformed, and made available for analysis.*

Provenance is economically relevant as well as epistemically relevant. The ability to collect and combine data can improve matching, forecasting, fraud detection, service design, scientific inquiry, or public administration. The same ability can create asymmetry when one position observes another in detail while access to the resulting representation, correction process, or inferential model remains one-sided. Documentation practices such as datasheets illustrate one response to this broader problem by making motivation, composition, collection, recommended uses, and dataset history explicit (Gebru et al. 2021).

Proposition 21.519 (Data-value non-equivalence). *Data quantity, data quality, informational usefulness, economic value, and normative legitimacy should remain separate analytical dimensions because improvement in one dimension does not establish improvement in the others.*

This distinction is especially important for GRE. A large dataset can improve a prediction while narrowing the categories through which a subject becomes economically legible. A small dataset can be highly valuable when it concerns a scarce scientific or operational process. Data may support future capability when they enable learning and coordination, while the same data architecture can reduce future op-

tions when exit, correction, or reuse rights are highly asymmetric. The generative question therefore concerns the relation in which data are produced and used.

21.24.3 Network Effects

Network effects identify a mechanism through which the value or usefulness of participation depends on the participation or adoption decisions of others. Katz and Shapiro analyze systems competition in settings where compatibility and installed base affect product value and competitive dynamics (Katz and Shapiro 1994). Platform analysis extends this mechanism across participant sides: additional participation by one group can increase or reduce value for another (Rochet and Tirole 2003). The resulting feedback can influence entry, pricing, standardization, and the persistence of particular systems.

Definition 21.520 (Network-dependent participation value). *Network-dependent participation value* is the component of a participant's expected or realized value that changes materially with the number, composition, activity, compatibility, or position of other participants or complementary components in the relevant system.

The definition keeps several mechanisms visible. Same-side effects concern relations among participants of a similar type. Cross-side effects concern interactions among different participant groups. Compatibility effects concern whether products, services, identities, files, applications, or standards can interoperate. Complement effects concern the availability of associated goods or services. Congestion can produce negative effects when additional participation lowers service quality or intensifies competition for scarce attention or capacity.

Proposition 21.521 (Network-effect specification). *A network-effect claim should identify the relevant participant set, the direction of the effect, the mechanism connecting participation to value, and the range over which the effect is expected to operate.*

Network effects can contribute to concentration, while concentration remains a broader outcome. Scale economies, data advantages, brand, contractual restrictions, technical standards, capital requirements, regulatory structure, switching costs, acquisitions, and complementary assets can also affect concentration. Conversely, interoperability, multihoming, open standards, or low switching costs can weaken the persistence associated with an installed-base advantage. The presence of a network effect therefore supplies one causal mechanism rather than a complete market-structure diagnosis.

Proposition 21.522 (Network-effect concentration boundary). *Inference from a network effect to monopoly, durable dominance, welfare loss, or irreversibility requires additional evidence about entry, interoperability, multihoming, switching, governance, and competing mechanisms.*

For GRE, network effects have a temporal significance because present participation can alter the future feasibility of alternative networks. Early adoption can attract complements, investment, skills, standards, and reputational infrastructure. These cumulative processes can make later switching more costly even when the original technological difference was modest. A generative analysis should therefore study

both current participation value and the way installed relations reshape the future option set.

21.24.4 Attention

Digital abundance makes attention economically salient because growth in available information does not proportionally expand a recipient's capacity to inspect, interpret, or act on it. Simon's formulation of an information-rich world identifies recipient attention as the scarce resource consumed by abundant information sources (Simon 1971). Search engines, feeds, recommendation systems, advertising markets, notifications, rankings, and interface defaults can therefore become allocation mechanisms for scarce orientation.

Definition 21.523 (Mediated attention allocation). *Mediated attention allocation* is the patterned distribution of visibility, salience, sequence, or discoverability among competing informational or economic objects through an interface, institution, or ranking process.

Attention allocation can influence economic outcomes because visibility affects discovery, demand formation, reputation, participation, and access to opportunities. A creator placed prominently in a recommendation feed may receive more opportunities for evaluation; a seller appearing high in search results may receive more transactions; a worker receiving rapid task notifications may gain access to work before others. These consequences establish attention as an economic interface while leaving the recipient's eventual judgment open.

Proposition 21.524 (Attention-conversion condition). *The economic consequence of attention depends on the conversion pathway connecting visibility to later action, transaction, recognition, learning, or resource allocation; exposure alone does not establish any of those outcomes.*

This distinction separates attention from preference. A person can see an object without valuing it, value it without acting, act under constraint, or discover a preference through exposure and learning. Similarly, engagement metrics represent selected manifestations of interaction rather than a complete measure of welfare, interest, or social value. Chapter 17 developed attention as part of the epistemic economy; the present dialogue adds the platform-economic question of who controls the interfaces through which scarce attention is allocated.

Proposition 21.525 (Attention-metric boundary). *A metric of clicks, viewing time, impressions, reactions, or other observable engagement should be treated as a representation of selected behavior rather than as a direct measure of preference, welfare, consent, or heterogeneous value.*

Attention can also accumulate. Repeated visibility can produce familiarity, data, reputation, complementary investment, and further recommendation, creating a feedback process between past allocation and future discoverability. The result can support learning and coordination while also narrowing exposure to alternatives. The relevant economic question concerns how the allocation rule, participant response, and feedback structure jointly shape later opportunities.

21.24.5 Algorithmic Intermediation

Algorithmic intermediation concerns computational procedures that rank, match, predict, price, schedule, recommend, moderate, classify, or evaluate within an economic relation. Such procedures can process information at scales and speeds difficult to achieve through direct human administration. They can also standardize criteria, update decisions rapidly, and coordinate large participant populations. Their economic significance depends on the institutional role in which the procedure is embedded.

Definition 21.526 (Algorithmic intermediation). *Algorithmic intermediation* is the use of computational procedures to transform data into rankings, classifications, predictions, matches, prices, schedules, recommendations, or other decision-relevant outputs that condition economically consequential interaction.

The same technical procedure can occupy different economic roles. A recommender can assist discovery, an allocation algorithm can distribute tasks, a fraud model can condition payment access, and a performance system can shape promotion or dismissal. Organizational research on algorithms at work shows that computational systems can become mechanisms of direction, evaluation, and discipline within labor processes (Kellogg et al. 2020). This places algorithmic intermediation within organizational control as well as prediction technology.

Opacity also has several sources. Burrell distinguishes secrecy, technical-literacy barriers, and opacity arising from the characteristics and scale of machine-learning systems (Burrell 2016). These forms have different remedies. Disclosure can address some secrecy, explanation and institutional support can address some literacy barriers, and audit or verification procedures may be required when behavior cannot be reconstructed through ordinary inspection.

Proposition 21.527 (Algorithmic-institution condition). *The economic effect of an algorithm should be analyzed together with its objective, training or input data, institutional mandate, decision authority, affected positions, update process, and available routes of review or contestation.*

Kroll and colleagues develop accountability approaches for consequential algorithmic decisions that rely on technical and institutional procedures beyond ordinary review of a human decision maker (Kroll et al. 2017). The underlying point is broader than legal accountability. Computational intermediation can separate the party affected by a decision from the actors who select objectives, collect data, implement the model, set thresholds, and govern appeals. Responsibility therefore becomes distributed across a technical-institutional chain.

Proposition 21.528 (Algorithmic accountability relation). *Accountability for algorithmic intermediation requires identification of the actors and institutions responsible for objectives, data, implementation, decision authority, monitoring, correction, and appeal, with the computational procedure treated as one component of the decision architecture.*

Algorithmic outputs can feed back into their own future inputs. A ranking changes visibility; visibility changes interaction; interaction generates new data; new data influence later rankings. A labor allocation system can similarly shape which workers accumulate experience and performance records. These recursive effects make

temporal analysis particularly important because an apparently local decision can modify the data-generating environment on which later decisions rely.

21.24.6 Digital Labor

Digital labor is a heterogeneous category. It can refer to work obtained through platforms, work coordinated or evaluated through digital systems, remote work enabled by communication infrastructure, content or moderation work performed inside digital ecosystems, and tasks reorganized by automation or artificial intelligence. These forms share technological mediation while differing substantially in contract, skill, autonomy, bargaining position, location, and relation to the output produced.

Definition 21.529 (Digitally mediated labor relation). A *digitally mediated labor relation* is a labor relation in which access to work, task decomposition, coordination, monitoring, evaluation, remuneration, communication, or output distribution depends materially on digital infrastructure or computational intermediation.

This definition preserves labor as a social and institutional relation. A worker using ordinary software does not necessarily face algorithmic management; a platform contractor can encounter detailed computational scheduling and evaluation without holding a conventional employment contract; an employee may work remotely while retaining substantial discretion; a content creator may depend on ranking and monetization systems even without receiving task assignments from the platform. Digital mediation therefore modifies labor through several channels.

Task-based economic analysis helps distinguish automation from labor displacement as a whole. Acemoglu and Restrepo separate displacement through automation from reinstatement through the creation of new tasks, emphasizing that technological change can reorganize the task content of production rather than produce one uniform employment effect (Acemoglu and Restrepo 2019). The distinction is useful for digital labor because the same system can automate one activity, create complementary tasks, change required skills, and redistribute monitoring or coordination work.

Proposition 21.530 (Digital task-recomposition condition). *Analysis of digitally mediated work should identify which tasks are automated, created, recombined, intensified, relocated, or newly measured and should distinguish those changes from aggregate claims about employment or labor demand.*

Algorithmic management adds another dimension. Kellogg, Valentine, and Christin show how algorithms can become contested mechanisms of control when they direct, evaluate, or discipline work (Kellogg et al. 2020). Digital systems can also increase worker capability by improving information, reducing coordination burdens, expanding market access, or supporting performance. The distributional question concerns which gains are realized by workers, customers, platform owners, complements, or other positions and how bargaining institutions affect that division.

Proposition 21.531 (Digital-labor control differentiation). *Digital monitoring, task allocation, performance evaluation, communication infrastructure, and contractual status should be analyzed as distinct dimensions of labor control because they can vary independently within the same workplace or platform relation.*

Digital labor can also generate data as a by-product of work. Performance traces, interaction records, ratings, location histories, or content can improve later coordination systems. Whether those data return capability or value to workers depends on access, portability, governance, bargaining, and ownership arrangements. The labor relation therefore can become simultaneously productive, informational, and infrastructural.

21.24.7 Rent and Control

Digital political economy frequently emphasizes rent, concentration, and control. These concepts require careful separation. Profit can arise from innovation, risk bearing, organizational capability, temporary scarcity, market power, contractual rights, ownership, or several mechanisms together. Economic rent likewise has several theoretical meanings. The present comparative purpose is therefore to identify the concrete control position that supports a persistent claim on value and to classify digital income according to the mechanism that generates it.

Definition 21.532 (Digital interface control). *Digital interface control* is the capacity to set, withhold, modify, or condition access to a technical or institutional interface through which other actors conduct economically consequential activity.

Interfaces can include application stores, payment rails, identity systems, cloud services, advertising exchanges, data repositories, software standards, ranking systems, marketplaces, or APIs. Control can derive from property, contract, technical design, regulatory authorization, organizational hierarchy, intellectual property, installed base, or dependence on complementary assets. Property-rights theory offers one useful analytical distinction by treating ownership as an allocation of residual control rights when contracts cannot specify every future use of an asset (Grossman and O. D. Hart 1986; O. Hart and Moore 1990). Digital systems add layers in which control over software, data, standards, and access permissions can be distributed across different actors.

Proposition 21.533 (Digital control-bundle condition). *Claims about digital control should identify the relevant bundle of rights or practical capacities, including where appropriate access, exclusion, modification, data use, standard setting, pricing, ranking, interoperability, and residual decision authority.*

A bottleneck position can support rent-like returns when participants lack practical alternatives and access to the bottleneck is scarce or controlled. Network effects can reinforce such a position, yet they are only one mechanism. Contractual restrictions, reputation non-portability, accumulated data, complementary assets, capital requirements, or regulatory barriers can also matter. Srnicek's analysis of platform capitalism emphasizes the strategic importance of data, network effects, and infrastructural positioning within contemporary accumulation (Srnicek 2016). Empirical work on superstar firms likewise shows that increasing concentration can coexist with high productivity and declining labor shares in sectors where activity reallocates toward leading firms (Autor et al. 2020). These literatures motivate analysis of concentration without resolving its cause in advance.

Proposition 21.534 (Digital-rent source specification). *A claim of digital rent should specify the scarce asset, right, interface, positional advantage, or dependency relation*

that supports the return and distinguish that mechanism from ordinary profit accounting or concentration alone.

Control can also be distributed. A platform operator may control ranking while a payment provider controls settlement, a device manufacturer controls installation, a regulator controls licensing, and users collectively supply the participation that gives the network value. Economic power can therefore emerge from coupled control positions rather than a single owner. GRE's power analysis is useful where these positions alter another subject's feasible actions, conversion possibilities, or future options, while the empirical identification of each control mechanism remains domain-specific.

Proposition 21.535 (Coupled digital control). *Digital market power may arise from interacting control positions held by different actors; analysis should therefore reconstruct the dependency chain and identify whether control is unitary, distributed, or layered.*

21.24.8 Relational Reconstruction

The preceding coordinates can be reconstructed within GRE as components of a history-bearing digital relational architecture. The relevant configuration includes participant positions, interfaces, data-generation processes, attention-allocation mechanisms, network dependencies, computational intermediaries, labor relations, ownership and control rights, standards, external institutions, and the temporal feedback through which present interaction changes later conditions. This reconstruction builds on the substantive platform analysis in Section 19.8 while serving a different purpose here: the present section compares GRE with existing economic traditions, whereas the earlier section provides a domain-level diagnostic.

Definition 21.536 (Digital relational architecture). *A digital relational architecture is a history-bearing configuration of participant positions, technical interfaces, data relations, attention mechanisms, computational rules, labor relations, standards, rights, and governance arrangements through which digital economic interactions are generated, stabilized, revised, and made consequential for later possibilities.*

The architecture makes several forms of recursion visible. Participation generates data that can improve matching or prediction; improved matching can attract participation. Attention produces interaction records that influence future rankings; rankings redistribute later attention. Labor produces both outputs and performance traces; those traces can shape later task allocation. Platform scale attracts complements; complements can increase the value of the platform. Control over an interface can generate revenue that finances further infrastructure and acquisition. Each loop can expand capability for some positions while increasing dependency for others.

Proposition 21.537 (Digital recursive-formation condition). *A digital economic mechanism becomes generatively consequential when its present operation changes the relations, capabilities, data, standards, dependencies, or institutional conditions that structure future economic interaction.*

This proposition identifies GRE's distinctive temporal question without claiming priority over the mechanisms themselves. Network economics already studies

installed-base effects; platform economics studies cross-side participation; organizational scholarship studies algorithmic control; data-centered economics studies measurement and prediction. GRE asks how these mechanisms combine across heterogeneous value forms and timescales to alter the future possibility structure of the configuration.

Definition 21.538 (Digital conversion interface). *A digital conversion interface is a digitally mediated arrangement through which one form of participation, data, attention, labor, reputation, access, or capability is transformed into another economically consequential form.*

Examples include the conversion of attention into advertising revenue, labor performance into ratings, ratings into task access, data into predictions, predictions into prices or eligibility, installed base into complement investment, or reputation into transaction opportunity. These conversions often cross heterogeneous value domains. Their governance determines who can initiate conversion, inspect its rule, contest an outcome, appropriate the resulting value, or preserve an alternative pathway.

Proposition 21.539 (Digital conversion-power condition). *Power over a digital conversion interface increases when a position can materially determine conversion rules or access while affected participants possess limited practical capacity to inspect, contest, substitute, or exit the conversion pathway.*

The relational reconstruction also distinguishes extraction from return. Data, attention, labor, and participation can create value for the wider system. Some of that value may return through lower prices, improved service, income, learning, reputation, infrastructure, interoperability, or collective capability. Other arrangements can concentrate gains while leaving participants dependent on the same interface that their activity helps reproduce. GRE therefore asks how generated value and capability circulate through the relation rather than presuming that either extraction or mutual benefit characterizes a digital system as a whole.

Proposition 21.540 (Digital generative-return condition). *A digital economic arrangement has stronger relational generativity when value and capability produced through participation contribute materially to the continuing capacity of relevant participants and institutions to learn, act, innovate, reorganize, and form viable alternatives.*

This condition remains evaluatively plural. A system can improve consumer convenience while weakening supplier bargaining; expand creator reach while increasing income volatility; improve prediction while reducing privacy; lower transaction cost while concentrating infrastructural control. GRE's heterogeneous-value architecture records these tensions without converting them automatically into one scalar judgment.

Proposition 21.541 (Digital heterogeneous-value condition). *Evaluation of a digital arrangement should preserve materially distinct value dimensions—including economic output, time, privacy, autonomy, learning, recognition, security, access, institutional capacity, and future option value—where their conversion into one common metric is unsupported.*

Finally, the reconstruction is epistemic. Data, metrics, rankings, predictions, and dashboards are manifestations of selected aspects of the underlying relational config-

uration. Their operational use can feed back into that configuration. A productivity score can alter work assignment; a risk score can alter access; a recommendation can alter visibility; a user category can change pricing. Digital economies therefore make especially visible the GRE distinction between relational reality and manifestational representation: representations can become causally effective while remaining partial.

Proposition 21.542 (Operational representation feedback). *When a digital representation is used to allocate access, visibility, price, work, or institutional standing, the representation can become part of the causal process that generates the later reality it is used to describe.*

21.24.9 Limits of Translation

The proximity between GRE and digital-economy analysis is substantial because both can study interaction, information, feedback, heterogeneous positions, and institutional mediation. Translation nevertheless remains partial. Digital economics, platform economics, organizational research on algorithms, labor economics, information economics, and political economy carry different research questions and evidential standards. GRE can connect their objects without replacing those domain-specific theories.

The first boundary concerns technological specificity. Lower search or replication cost is a concrete technological-economic mechanism (Goldfarb and Tucker 2019). Cross-side pricing is a platform mechanism (Rochet and Tirole 2003). Network effects arise through specified compatibility or participation relations (Katz and Shapiro 1994). Algorithmic opacity can arise through secrecy, expertise barriers, or model characteristics (Burrell 2016). Translating each mechanism into the generic language of relations would lose explanatory content if the specific mechanism were omitted.

Proposition 21.543 (Digital specificity preservation). *A GRE translation of digital-economy research should preserve the technological, contractual, organizational, and market mechanism established by the source theory alongside the relational reconstruction.*

The second boundary concerns data. Data can be economically valuable and causally consequential while remaining a partial representation generated through prior classifications and collection processes. GRE's manifestation language helps articulate that status, while statistical analysis, measurement theory, database engineering, privacy law, and sector-specific evidence remain necessary for claims concerning data quality and use.

Proposition 21.544 (Data-translation boundary). *GRE can analyze the relations through which data become consequential while empirical claims about data quality, inference, prediction, privacy, or system performance continue to require the methods appropriate to those objects.*

The third boundary concerns power. A platform can be large without controlling every participant action; a small interface can be highly consequential when alternatives are absent. Network effects, property rights, contractual restrictions, ranking authority, switching costs, information asymmetry, and regulatory privilege can each

contribute to power through different paths. GRE's power vocabulary can compare these paths, while identification of actual power requires evidence about dependencies and feasible alternatives.

Proposition 21.545 (Digital-power identification condition). *A claim of digital power should identify the affected capability or choice set, the mechanism through which another position conditions it, and the practical alternatives available to the affected position.*

The fourth boundary concerns labor. Automation, algorithmic management, remote work, platform contracting, and digitally assisted work can occur separately or together. Labor-market outcomes also depend on institutions, demand, bargaining, skill formation, task creation, and macroeconomic conditions. A digital-labor category is therefore useful for comparison only when the relevant labor mechanism remains explicit.

Proposition 21.546 (Digital-labor translation boundary). *GRE should preserve distinctions among task automation, labor-process control, contractual status, workplace capability, labor demand, and distribution when translating research on digitally mediated work.*

The fifth boundary concerns rent. Platform political economy often uses rent and extraction to emphasize asymmetric appropriation or control over infrastructural positions. These categories can reveal important distributional structures. Their use within a comparative chapter should nevertheless identify the theoretical definition and empirical source of the return. Profit, monopoly profit, quasi-rent, innovation return, land-like rent, intellectual-property income, and returns to a bottleneck position are related but non-identical categories.

Proposition 21.547 (Digital-rent translation boundary). *A relational reconstruction should retain the theory-specific meaning of rent and state the mechanism supporting the return before linking that return to GRE concepts of conversion, capture, or power.*

The final boundary concerns normative inference. Greater interoperability, stronger privacy, wider data access, tighter platform control, more decentralization, or stronger personalization can each be valuable under some conditions and costly under others. Technical architecture redistributes capabilities, risks, and responsibilities across heterogeneous positions. Evaluation therefore requires an explicit normative criterion in addition to descriptive relational analysis.

Proposition 21.548 (Digital normative-separation condition). *Descriptive findings about digital scale, network structure, data accumulation, algorithmic coordination, labor organization, or interface control should remain distinct from normative conclusions until the relevant evaluative criterion and affected positions are specified.*

The dialogue with digital, platform, and data-centered economics therefore yields a bounded result. Existing literatures specify mechanisms of cost reduction, multi-sided coordination, data generation, network feedback, attention allocation, algorithmic control, task recomposition, and infrastructural concentration. GRE connects these mechanisms through time and examines their effects on heterogeneous value, power, capability, epistemic representation, and future possibility. The correspondence is strongest when domain theory supplies the mechanism and GRE supplies relational-generative coordinates for their interaction.

21.25 Translation among Economic Theories

The theory-specific reconstructions in Sections 21.12–21.24 establish that economic traditions can illuminate overlapping objects while organizing those objects through different concepts, scales, temporalities, evidential practices, and value commitments. The role of the present section is to make the act of translation itself an explicit object of analysis. Its objective is to distinguish several forms of cross-theoretical translation, state the conditions under which each form is warranted, and identify what can be lost when a concept or explanation is moved between theoretical architectures. The discussion proceeds through conceptual, functional, structural, historical, cross-scale, and cross-value-regime translation before examining translation loss and non-equivalent translation. The method is comparative and metatheoretical. It uses the common coordinates developed in Section 21.3 while treating every translation as a scoped reconstruction rather than as evidence that the source and target theories are interchangeable. Table 21.25 summarizes the resulting translation modes and their principal safeguards.

Translation is required because theories rarely divide economic reality at identical joints. A “preference” in one framework, a “capability” in another, a “class position” in a third, and a “relationally constituted subject position” in GRE can each organize inquiry into economically consequential action, yet their meanings, explanatory roles, and normative implications differ. Similar difficulties arise with value, institutions, power, equilibrium, reproduction, uncertainty, care, ecological constraint, network position, and platform control. Cross-theoretical dialogue therefore requires more than substituting one vocabulary for another. It requires an account of what relation is being preserved through the substitution and what remainder is being left behind.

Definition 21.549 (Theoretical translation). A *theoretical translation* is an explicit, scoped mapping from an object, concept, relation, mechanism, representation, or explanatory role in a source theoretical configuration to an object, concept, relation, mechanism, representation, or explanatory role in a target theoretical configuration, together with a statement of what is intended to be preserved and what remains outside the mapping.

Definition 21.549 makes translation directional. Translating a capability into a GRE relational description need not yield the same result as translating a GRE generative-capacity claim into capability language. The source theory determines what must first be reconstructed on its own terms; the target theory determines the vocabulary and distinctions available for the mapping. Translation can therefore be informative in one direction and coarse in the other.

Proposition 21.550 (Translation-warrant condition). A *cross-theoretical translation* is warranted only to the extent that the analyst identifies the source object, target object, preserved relation, relevant scale and time horizon, inferential purpose, and known remainder of the mapping.

The proposition establishes a minimum discipline for the remainder of the chapter. A translation can be useful even when incomplete. Its adequacy depends on whether the preserved feature is the feature relevant to the question being asked.

Table 21.25: Translation modes among economic theories

Translation mode	Primary object preserved	Minimum warrant	Principal risk
Conceptual	Meaning-bearing distinctions and category boundaries	Source definition, target definition, shared referent or problem, and explicit remainder	Synonymy inferred from lexical resemblance
Functional	Contribution performed within an explanatory or institutional system	Specified function, relevant conditions, substitutes, and performance domain	Similar outcome inferred to imply similar mechanism
Structural	Pattern of relations among positions or components	Identified nodes or positions, relation types, directionality, and boundary conditions	Topological resemblance treated as substantive identity
Historical	Sequence, inheritance, reproduction, and transformation through time	Periodization, mechanism of persistence or change, and historically situated categories	Present categories projected backward or sequence compressed
Cross-scale	Relations between analytical levels or spatial and temporal scales	Aggregation or decomposition rule, cross-level mechanism, and scale-specific evidence	Properties transferred across levels without warrant
Value-regime	Evaluation, commensuration, conversion, and recognition relations	Value form, evaluator, conversion procedure, losses, and normative standing	Heterogeneous values collapsed into one metric
Loss-aware	Explicit record of information, mechanism, or normative content discarded in translation	Identified omitted dimensions and consequences for inference	Remainder treated as negligible by default
Non-equivalent	Limited intelligibility without a claim of substitutability or equivalence	Precisely stated partial correspondence and stopping condition	Dialogue converted into forced synthesis

21.25.1 Conceptual Translation

Conceptual translation concerns the movement of a meaning-bearing distinction from one theoretical vocabulary into another. It is the most familiar form of translation and one of the easiest to overstate. A concept is rarely exhausted by a dictionary definition. Its meaning is partly determined by the contrasts it draws, the questions it makes visible, the assumptions under which it operates, and the inferential consequences attached to its use.

Consider “scarcity.” In a choice-theoretic context, scarcity can characterize a relation between limited means and competing ends. In institutional analysis, scarcity can be partly produced by property rules, access restrictions, or organizational arrangements. In ecological economics, the relevant constraint can be biophysical and

regenerative. In the epistemic economy, attention can become scarce under informational abundance. Section 21.8 showed that these uses can be placed in dialogue through a common scarcity–access–distribution architecture. The translation succeeds only if the distinct generating conditions remain visible.

Definition 21.551 (Conceptual translation). A *conceptual translation* maps a concept in a source theory to a concept or structured set of concepts in a target theory while preserving a specified semantic distinction, analytical referent, or inferential role.

Conceptual translation can take several forms. A near-direct translation preserves a relatively close distinction. A decompositional translation maps one source concept into several target concepts. A compositional translation reconstructs one target concept from several source distinctions. A contrastive translation identifies a shared object while preserving different conceptual cuts through that object. These forms should be distinguished because they imply different losses.

Proposition 21.552 (Conceptual-context condition). *Lexical similarity is insufficient for conceptual translation; the relevant contrasts, assumptions, inferential roles, and domain conditions of the source and target concepts must also be compared.*

The condition is especially important where familiar economic words carry theory-specific meanings. “Value” can refer to utility, labor-mediated social form, market price, capability evaluation, care-related worth, ecological significance, relational value, or generative consequence. “Power” can refer to bargaining leverage, class relation, authority, network position, control rights, dependency, or relational conversion of asymmetry. “Institution” can refer to rules, habits, organizations, stabilized social relations, or historically instituted arrangements. A translation that replaces these terms one-for-one can remove the distinctions that made the source theory explanatory.

GRE can support conceptual translation because its relational coordinates allow several theories to be described within one comparative interface. That usefulness creates a corresponding risk. If every concept is redescribed as a relation, configuration, constraint, or generative process, conceptual specificity can disappear behind broad vocabulary. A careful GRE translation should therefore preserve the source concept’s own internal distinctions before expressing its relational profile.

Proposition 21.553 (Conceptual-remainder condition). *A conceptual translation should record the aspects of the source concept that the target vocabulary does not preserve, especially where the omitted content carries historical, normative, institutional, or methodological significance.*

Conceptual translation is consequently a bridge for inquiry rather than a claim that two theoretical languages say the same thing. Its principal contribution is to make differences comparable without dissolving them.

21.25.2 Functional Translation

Functional translation asks what an object, relation, rule, institution, or concept does within a theoretical or economic configuration. Two structures can differ in composition while performing a partially comparable function. Price signals, administrative allocation, community rules, reputation mechanisms, and platform ranking can each

coordinate access under some conditions. Household care, public provision, market purchase, and cooperative provision can each contribute to the reproduction of capabilities. Money, credit arrangements, guarantees, and institutional commitments can each support coordination across time in distinct ways.

Definition 21.554 (Functional translation). A *functional translation* maps a source object or mechanism to a target object or mechanism by reference to a specified contribution it performs within an identified system and domain of conditions.

The phrase “specified contribution” is essential. Functional claims become vague when the function is described only as “coordination,” “efficiency,” “stability,” or “value creation.” The analyst should specify the relevant output, affected positions, time horizon, and environmental conditions. A mechanism that coordinates exchange under repeated interaction may fail under anonymity. A governance form that preserves a local commons may not scale through simple replication. A digital reputation system and long-term interpersonal trust can both support cooperation while generating different vulnerabilities and evidential traces.

Proposition 21.555 (Functional-domain condition). *Functional translation requires specification of the function, the system boundary within which it is performed, the conditions supporting performance, and the criteria by which the functional claim is evaluated.*

Functional translation can reveal substitutes and complements. A market and a hierarchy can sometimes solve related coordination problems while distributing decision rights differently. A formal contract and a trust relation can sometimes support exchange jointly rather than substitutively. Public infrastructure can enable market activity that would otherwise be infeasible. The relevant translation therefore concerns a role within an architecture, not an isolated object.

The distinction between function and mechanism also protects against premature theoretical convergence. Two arrangements can produce similar observed outcomes through different causal processes. Conversely, similar mechanisms can perform different functions when embedded in different institutional settings. A price change may ration demand, transmit information, redistribute purchasing power, alter expectations, or trigger institutional response. Which function matters depends on the theoretical question.

Proposition 21.556 (Function–mechanism distinction). *Functional correspondence does not by itself establish mechanism correspondence; a valid translation should state separately what contribution is shared and how each theory explains the production of that contribution.*

Functional translation is therefore particularly useful for institutional comparison. It permits dialogue among theories that classify economic arrangements differently while still asking whether those arrangements address related coordination, provisioning, reproduction, learning, or governance problems.

21.25.3 Structural Translation

Structural translation shifts attention from isolated concepts to patterned relations among positions. The source object can be a class structure, ownership arrangement,

input–output relation, network, household organization, governance system, platform architecture, or ecological dependency. Translation asks whether a relevant relational pattern can be represented in another theoretical language while preserving the relations that matter to the explanation.

Definition 21.557 (Structural translation). A *structural translation* maps a source configuration to a target representation by preserving a specified pattern of positions, relations, dependencies, constraints, or transformation rules across an explicitly stated boundary.

Structural translation can be more demanding than conceptual translation because relations are jointly defined. Ownership means something different when voting rights, residual claims, control rights, exit options, and legal liabilities are distributed differently. A household cannot be translated adequately into a representative decision unit when the question concerns intrahousehold bargaining or care dependency. A platform cannot be translated into a conventional firm model if cross-side participation and interface control are central to the phenomenon under study.

Proposition 21.558 (Structural-relation preservation). A *structural translation* should identify which positions and relation types are preserved, which are aggregated or omitted, and whether directionality, multiplicity, hierarchy, feedback, or boundary membership is altered by the target representation.

Section 21.6 established that exchange, production, ownership, labor, care, network, ecological, institutional, and power-bearing relations can overlap within one economic configuration. Structural translation should therefore resist the temptation to choose a single relation merely because the target theory represents it conveniently. The appropriate target structure depends on the explanatory object.

GRE's relational language can make structural correspondences unusually visible. Class positions can be represented through relations of control and appropriation; capability constraints through access and conversion relations; network positions through adjacency and intermediation; care dependency through asymmetric reproductive relations; platform power through infrastructural mediation. Yet these redescriptions preserve only part of the source theories. Marxian class, capability freedom, care ethics, and platform governance contain theoretical content beyond a graph of relations.

Proposition 21.559 (Structural-semantic remainder). *Preservation of a relational pattern does not establish preservation of the semantic, historical, normative, or causal interpretation attached to that pattern in the source theory.*

Structural translation prepares the stronger equivalence questions addressed in Section 21.26. At the present stage, the objective is narrower: to identify which structures can be compared and which properties the comparison actually preserves.

21.25.4 Historical Translation

Historical translation concerns theoretical claims whose meaning depends on sequence, inheritance, institutional formation, or historically specific categories. It is necessary because an economic concept can change its referent as the underlying

configuration changes. “Labor,” “firm,” “market,” “household,” “property,” “money,” “platform,” and “data” can each refer to institutions with materially different legal, technological, and social architectures across periods.

Definition 21.560 (Historical translation). A *historical translation* reconstructs a source concept, mechanism, or configuration across temporal contexts while preserving the historically relevant sequence, inherited conditions, category formation, and mechanisms of persistence or transformation.

Historical translation has two directions. Diachronic translation compares a concept or mechanism across periods within a tradition or domain. Cross-theoretical historical translation compares theories whose categories were formed in different historical settings. Classical political economy, Marxian analysis, Keynesian theory, institutional economics, platform economics, and ecological economics each emerged in relation to different economic problems and institutional environments. Their categories can remain useful outside their originating contexts, but that extension requires argument.

Proposition 21.561 (Historical-specificity condition). A *historical translation* should distinguish properties that belong to the general analytical relation from properties that depend on a particular institutional, technological, legal, ecological, or political configuration.

Sequence matters as well as context. Path-dependent analysis in Sections 21.16 and 21.18 showed that earlier states can change the accessibility of later states. Keynesian and Post-Keynesian analysis in Section 21.15 showed that expectations and irreversible commitments can make historical time economically consequential. Marxian political economy in Section 21.14 embeds categories in historically specific relations of production and accumulation. Translating these accounts into a static relational description would preserve positions while losing the process by which those positions became possible.

Proposition 21.562 (Sequence-preservation condition). Where a source explanation is sequence-sensitive, a translation that preserves only initial and final states is insufficient unless the omitted sequence is shown to be irrelevant to the claim being translated.

Historical translation also disciplines GRE. A generative-relational vocabulary can describe how present relations condition later possibilities, yet it should not retroactively redescribe every historical theory as if it had already formulated generativity, relational reality, or open possibility spaces. Historical dialogue requires preserving the conceptual resources actually available to the source tradition while using GRE only as a later comparative language.

21.25.5 Translation across Scales

Economic theories operate at different scales of observation and intervention. Individual choice, household organization, firm governance, class structure, network topology, institutional systems, national macroeconomies, global production arrangements, and social–ecological systems are not interchangeable units. Section 21.4 treated scale selection as part of object construction. Translation across scales therefore requires an account of how properties move, aggregate, decompose,

or transform between analytical levels.

Definition 21.563 (Cross-scale translation). A *cross-scale translation* maps a claim, mechanism, or representation between analytical levels or spatial, organizational, or temporal scales through an explicit aggregation, decomposition, coupling, or emergence relation.

A familiar problem arises when individual-level properties are attributed directly to aggregates. Household saving decisions do not automatically determine macroeconomic saving outcomes under every demand regime. Individual preferences do not by themselves determine institutional categories. Firm-level adaptation does not imply system-level optimality. Local cooperation does not establish global governance capacity. Conversely, macroeconomic or institutional regularities cannot always be assigned directly to individuals as stable dispositions.

Proposition 21.564 (Cross-scale mechanism condition). *Translation across scales requires a specified mechanism connecting the levels; aggregation, decomposition, or emergence should not be inferred solely from similarity of labels or outcomes across levels.*

Scale also changes the meaning of relations. A network tie can be consequential at the dyadic level while system-wide outcomes depend on topology. A local ecological practice can be regenerative in one watershed while shifting pressure elsewhere. A household care arrangement can sustain members while depending on national labor markets and public services. A platform rule can appear as an interface choice to one participant and as infrastructural governance at the system level.

Definition 21.565 (Scale-relative adequacy). *Scale-relative adequacy* is the extent to which a theoretical representation preserves the relations and mechanisms relevant to a claim at the analytical level for which that claim is made.

This definition prevents scale pluralism from becoming indiscriminate multi-level description. A theory can be highly adequate at one scale and intentionally silent at another. Neoclassical choice theory can illuminate local constrained choice without supplying a historical theory of preference formation. Network analysis can reveal positional patterns without identifying the full institutional meaning of each tie. Macroeconomic accounting can establish aggregate identities without reconstructing household experience.

Proposition 21.566 (Scale-specific translation warrant). *A successful translation at one scale should not be generalized to another scale unless the cross-scale relation and its evidential support are independently established.*

GRE benefits from multi-level relational representations, but those representations should preserve the explanatory autonomy of scale-specific theories where appropriate. A multi-scale map is valuable when it clarifies coupling; it becomes misleading when it treats every level as a projection of one preferred ontology.

21.25.6 Translation across Value Regimes

Value creates a particularly difficult translation problem because economic theories can disagree about both the object of valuation and the procedure through which evaluation becomes legitimate. Section 21.7 distinguished utility, labor-mediated value,

price signals, capabilities, care value, ecological value, relational value, and generative value. These categories can overlap in empirical settings while remaining theoretically heterogeneous.

Definition 21.567 (Value-regime translation). A *value-regime translation* maps evaluative claims across theories or practices by specifying the valued object, evaluator or evaluative position, value form, comparison rule, conversion procedure, institutional context, and remainder that resists or escapes conversion.

Translation across value regimes is sometimes operationally necessary. Public decisions compare monetary cost, capability effects, care burdens, ecological impacts, distributional incidence, and long-run generative consequences. Organizations convert heterogeneous performance dimensions into rankings or budgets. Households translate time, money, obligation, affection, and future security into practical decisions. Such conversion practices are economically consequential even when no philosophically complete commensuration exists.

Proposition 21.568 (Value-conversion transparency). *Where heterogeneous values are translated into a common decision representation, the conversion rule, decision authority, exclusions, uncertainty, and unrepresented remainder should remain visible in the analysis.*

A monetary valuation can support comparison without exhausting the value of an ecological system. A capability indicator can reveal substantive opportunity without capturing every dimension of agency or meaning. A measure of unpaid care time can make hidden labor visible without reducing care to hours. A generative-value analysis can trace downstream capability formation without deciding every normative conflict among beneficiaries, non-human affected entities, and future generations.

The translation problem is therefore partly political. Control over categories, metrics, discount rates, eligibility rules, data standards, and conversion procedures can determine which values become institutionally actionable. A technically coherent commensuration can still reflect contested authority over what is recognized.

Proposition 21.569 (Value-translation governance condition). *Translation across value regimes should include the governance of valuation itself, especially where actors differ in their ability to define categories, select metrics, authorize conversions, or make resulting representations consequential.*

GRE's heterogeneous-value vocabulary is useful here because it can represent conversion, circulation, capture, dissipation, and return without assuming a universal scalar. That flexibility also creates a responsibility to avoid empty pluralism. The analyst should still specify what is valued, how it is evidenced, and which normative judgment remains outside the formal translation.

21.25.7 Translation Loss

Every translation selects. It preserves some distinctions and compresses others. Translation loss is therefore a normal feature of cross-theoretical dialogue rather than an exceptional failure. The relevant question is whether the lost content matters for the inference, explanation, evaluation, or intervention being considered.

Definition 21.570 (Translation loss). *Translation loss* is the set of distinctions, re-

lations, mechanisms, historical conditions, evidential warrants, normative commitments, or practical implications present in a source theoretical configuration that are omitted, merged, weakened, or transformed in the target representation.

Loss can be semantic, structural, historical, scalar, evidential, or normative. A network representation can preserve ties while losing institutional meaning. A welfare metric can preserve an ordering while losing the process through which preferences were formed. A capability measure can preserve selected opportunity dimensions while losing interpersonal care relations. A macroeconomic aggregate can preserve accounting relations while losing distributional positions. A GRE relational reconstruction can preserve dependence and generativity while losing the source theory's distinctive moral vocabulary.

Definition 21.571 (Material translation loss). A *material translation loss* is a translation loss whose omission can change the conclusion, explanatory mechanism, normative evaluation, empirical test, or intervention implied by the translated representation.

The distinction between ordinary and material loss makes translation practically usable. Complete preservation is rarely possible and often unnecessary. A simplified model can be adequate for a narrow question if the omitted dimensions do not affect that question. Conversely, a seemingly small omission can be material when it removes a boundary condition or distributional consequence.

Proposition 21.572 (Loss-audit condition). A *consequential cross-theoretical translation* should include a *loss audit* identifying the principal omitted dimensions and assessing whether any omission is material to the intended use of the translation.

Loss can also be asymmetric. Translating a rich historical account into a compact formal model can remove context; translating the formal model into narrative prose can remove precision about assumptions and derivation. Translating ethnographic evidence into categorical variables can improve comparability while losing situated meaning; translating statistical regularities into case narratives can obscure population-level frequency and uncertainty. Methodological dialogue therefore requires attention to what each evidential form cannot carry into another.

Proposition 21.573 (Asymmetric-loss condition). *Translation loss should be assessed directionally because the information preserved when moving from theory or method A to B can differ from the information preserved when moving from B to A.*

The loss audit also provides a discipline for interdisciplinary work. It turns the question from whether two theories can be “integrated” into the more precise question of which elements can be translated for a given purpose, which elements remain theory-specific, and which omissions would distort the result.

21.25.8 Non-Equivalent Translation

Some translations are useful precisely because they stop before equivalence. Two theories can render one another partially intelligible while continuing to disagree about ontology, mechanism, evidence, value, history, or normative purpose. Non-equivalent translation gives such dialogue a positive analytical status.

Definition 21.574 (Non-equivalent translation). A *non-equivalent translation* is a

mapping that establishes a limited correspondence sufficient for comparison, communication, or joint inquiry while explicitly withholding a claim that the source and target concepts, structures, mechanisms, or explanations are substitutable.

This form of translation is common across the traditions examined in this chapter. A capability can be translated into a relational profile of access and conversion without becoming identical to GRE generative capacity. Marxian exploitation can be represented through asymmetric production and appropriation relations without becoming interchangeable with a general GRE account of power. Minskyan financial instability can be related to nonlinear and path-dependent dynamics without becoming a generic critical-transition model. Care can be represented as a relation of dependency and reproduction without exhausting its ethical or experiential meaning. Ecological limits can enter a relational constraint architecture without becoming merely one more social constraint.

Proposition 21.575 (Partial-correspondence condition). *A non-equivalent translation should state the dimension along which correspondence holds and the dimensions along which substitutability is withheld.*

Non-equivalent translation has three advantages. First, it enables empirical cooperation among researchers who retain different theoretical commitments. Second, it allows one theory to borrow a measurement, mechanism, or distinction from another without claiming total synthesis. Third, it keeps contradiction visible where disagreement itself is informative.

Definition 21.576 (Translation stopping condition). *A translation stopping condition is a stated point at which further mapping would erase a distinction that is material to the source theory, target theory, empirical question, or normative evaluation.*

A stopping condition can arise when theories identify different objects, when their value commitments conflict, when one theory requires historical specificity that another abstracts away, when evidential warrants are incompatible for the claim at issue, or when the target language has no distinction capable of carrying the source concept without distortion. Stopping is therefore part of rigorous translation rather than evidence that dialogue has failed.

Proposition 21.577 (Non-equivalence discipline). *Theoretical dialogue should prefer an explicit partial translation to a stronger equivalence claim whenever the additional claim would require unverified preservation of structure, mechanism, history, scale, value, or evidential warrant.*

The distinction prepares the analysis in Section 21.26. Translation establishes intelligibility and scoped correspondence. Equivalence requires additional evidence about what structures or behaviors are preserved. Identity would require a still stronger claim. Keeping these levels separate allows Chapter 21 to compare economic theories without turning comparison into assimilation.

Proposition 21.578 (Translation hierarchy). *Conceptual, functional, structural, historical, cross-scale, and value-regime translations provide distinct kinds of correspondence; none of these forms alone establishes the stronger equivalence relations examined in Section 21.26.*

The translation framework developed in this section also changes the status of GRE within the chapter. GRE can function as one translation language because its

relational vocabulary is broad enough to represent many economic objects. That breadth does not give it privileged access to the meanings carried by other theories. Its adequacy must be tested translation by translation, with losses and stopping conditions made explicit. Sections 21.26–21.30 therefore move from translation to stronger equivalence claims, irreducible disagreement, multi-theoretical explanation, learning from existing economics, and the limits of GR itself as a translation language.

21.26 Equivalence without Identity

Section 21.25 established translation as a directional and scoped mapping among theoretical configurations. The role of the present section is to examine the stronger claim that two translated objects, structures, models, mechanisms, or representations are equivalent in some specified respect. Its objective is to distinguish several forms of equivalence, identify the evidence required for each form, and prevent a local correspondence from being expanded into a claim of theoretical identity. The discussion proceeds through isomorphism, homomorphism, simulation, bisimulation, functional equivalence, manifestational equivalence, and role equivalence before specifying limits on equivalence claims. The method is metatheoretical and formal-interpretive. Mathematical and computational terms are used as disciplined comparative relations whose economic meaning must be stated locally; they do not establish an ontology of economic reality. Table 21.26 summarizes the resulting equivalence relations and their principal warrants.

An equivalence claim is selective by construction. Two representations may preserve the same adjacency pattern while attaching different meanings to the relations. Two models may reproduce the same aggregate trajectory while assigning different mechanisms to its production. Two institutions may perform a comparable provisioning function while distributing authority, burden, and recognition differently. Two empirical states may present the same measured indicator while arising from distinct underlying relational configurations. The analytical task is therefore to state what is being treated as equivalent, under which mapping, at which scale and time horizon, and for which inferential purpose.

Definition 21.579 (Equivalence signature). An *equivalence signature* is the explicit set of objects, relations, properties, transformations, observables, functions, roles, scales, temporal conditions, and evaluative dimensions that an equivalence claim requires to be preserved.

The equivalence signature converts a broad resemblance into a testable comparative statement. A structural claim can require preservation of relation types and directionality. A dynamic claim can require preservation of admissible transitions. A functional claim can require comparable contribution to a specified system objective. A manifestational claim can require indistinguishability under a stated observation procedure. The signature therefore identifies both the content of the claim and its boundary.

Definition 21.580 (Scoped equivalence). Two theoretical or empirical configurations are *scoped-equivalent* when a stated mapping preserves the equivalence signature relevant to a defined analytical purpose and domain of conditions.

Proposition 21.581 (Equivalence-indexing condition). A *theoretically consequential equivalence claim* should identify its equivalence signature, mapping, domain, scale, time horizon, and inferential purpose before the claim is used for explanation, comparison, prediction, or intervention.

Definition 21.580 makes equivalence relative to a question rather than an unrestricted relation between theories. A neoclassical choice model and a behavioral model can yield equivalent predictions over a restricted decision domain while dif-

Table 21.26: Equivalence relations for cross-theoretical comparison

Relation	Primary preservation claim	Minimum comparative warrant	Principal remainder
Isomorphism	Specified structure in both directions	Bijective correspondence plus preservation and reflection of the selected relations or operations	Meaning, history, ontology, and normativity beyond the signature
Homomorphism	Selected structure in one mapped direction	Explicit mapping plus demonstrated preservation of designated relations or operations	Distinctions collapsed by the mapping
Simulation	Behavior of a target over a stated domain	Input/state correspondence, output or transition criterion, and error or tolerance conditions	Directional mechanism and untested behavior
Bisimulation	Matched admissible transitions in both directions	State relation, observable agreement, and reciprocal transition matching	Unrepresented semantics and off-domain dynamics
Functional	Contribution to a specified system function	Function definition, system boundary, conditions, and performance criterion	Mechanism, distribution, authority, and history
Manifestational	Indistinguishability under a stated observation regime	Observation operator, measurement resolution, and relevant evidence conditions	Underlying relational configuration and causal pathway
Role	Comparable relational position within an architecture	Role definition, relevant counterpart relations, and boundary conditions	Intrinsic attributes, local history, and role-specific meaning

fering in their accounts of cognition. A cooperative and a conventional firm can be equivalent with respect to a particular production function while differing in control rights and surplus allocation. A capability indicator and an income measure can coincide over a specific population without becoming equivalent evaluative frameworks. Equivalence becomes informative when the preserved dimension is explicit and the remainder remains visible.

21.26.1 Isomorphism

Isomorphism is the strongest structural relation used in this section. Its usefulness lies in exact preservation of a selected structure, while its danger lies in allowing exactness within that structure to appear broader than the structure actually specified.

Economic theories often contain mathematical objects for which isomorphism can be defined rigorously, yet a structural isomorphism between representations leaves open whether the represented economic meanings, histories, evidential warrants, and normative commitments are also preserved.

Definition 21.582 (Structural isomorphism). Let two representations be specified by domains of objects together with designated relations or operations. A *structural isomorphism* is a bijective mapping between the domains that preserves and reflects every relation or operation included in the stated equivalence signature.

The words “included in the stated equivalence signature” carry most of the methodological burden. A network representation of ownership can be isomorphic to another network with respect to directed edges while ignoring contract terms, voting rights, legal jurisdiction, historical formation, or the identities of the parties. Two input–output systems can be isomorphic at the level of sectoral dependence while differing in labor institutions, ecological burdens, or distributional incidence. A formal isomorphism therefore establishes exact correspondence only within the selected structure.

Proposition 21.583 (Structural-reflection condition). *An isomorphism claim warrants bidirectional structural substitution only for the relations and operations included in its equivalence signature and only within the domain for which the mapping is defined.*

Bidirectional substitution can be powerful. If a proof depends only on the preserved structure, an isomorphic representation can support the same structural inference. This permits one theory to borrow a formal result from another representation when the required structure has been demonstrated to correspond. The transfer remains conditional on the proof-relevant structure. An economic conclusion depending on institutional meaning, historical sequence, or normative evaluation requires additional argument.

Definition 21.584 (Isomorphic remainder). The *isomorphic remainder* is the set of theoretically or empirically relevant properties of the compared configurations that lie outside the structure preserved by the isomorphism.

A nonempty remainder is compatible with exact structural correspondence. This is especially important in Chapter 21 because the theories being compared frequently organize similar relations through different semantic and historical categories. A household bargaining structure, a class relation, a network brokerage position, and a capability-conversion relation can each admit formal representations with comparable topology. Their theoretical meanings remain different unless those meanings are also included and preserved in the equivalence signature.

Proposition 21.585 (Isomorphism–identity separation). *Structural isomorphism does not by itself establish identity of theoretical objects, empirical entities, causal mechanisms, historical formations, or normative interpretations.*

The proposition provides the first reason for the title of this section. Exact structural correspondence can coexist with substantive difference. GRE can therefore use isomorphism to identify transferable structural reasoning while retaining the source theory’s distinct conceptual and historical content.

21.26.2 Homomorphism

Many useful theoretical translations preserve less than an isomorphism. A richer configuration can be mapped into a coarser one while retaining selected operations or relations and collapsing others. Homomorphism provides a language for this asymmetric preservation. It is particularly relevant to economics because aggregation, coarse-graining, typification, institutional classification, and reduced-form representation routinely compress distinctions.

Definition 21.586 (Structural homomorphism). A *structural homomorphism* is a mapping from a source representation to a target representation that preserves the designated relations or operations included in the equivalence signature without requiring the mapping to be one-to-one, onto, or structurally reversible.

A homomorphic translation can map several heterogeneous household arrangements into one household category, several kinds of ownership relation into one control indicator, or several relational histories into the same state variable. Such a mapping can be analytically appropriate when the collapsed distinctions are irrelevant to the current question. The same compression can become material when the omitted distinction carries the mechanism being studied.

Definition 21.587 (Homomorphic collapse). A *homomorphic collapse* is the set of source distinctions that receive the same target representation under a structure-preserving mapping.

The concept makes aggregation visible as an epistemic act. Consider an analysis that maps diverse labor relations into employment status. The mapping can preserve participation in paid work while collapsing contract security, bargaining position, task control, dependence on platform ranking, and access to collective representation. The result can remain adequate for one question and inadequate for another.

Proposition 21.588 (Homomorphic-adequacy condition). A *homomorphic translation is adequate for a claim only when the distinctions collapsed by the mapping are immaterial to the inferential purpose of that claim.*

Homomorphism also clarifies a common relation between formal models and historically richer theories. A model can preserve a subset of causal or structural relations from a broader account while compressing the institutional and historical environment. Such a model need not be judged by whether it reproduces the entire source theory. Its adequacy depends on whether the preserved structure is sufficient for the proposition being investigated.

Proposition 21.589 (Homomorphism-direction condition). *The existence of a structure-preserving mapping from a richer source representation to a coarser target representation provides no general warrant for reconstructing the richer source from the target without additional information.*

The directionality mirrors the translation-loss analysis in Section 21.25. Compression can support comparison while limiting recovery. Recording the homomorphic collapse therefore becomes part of the warrant for using the reduced representation.

21.26.3 Simulation

Simulation shifts the equivalence question from static structure to behavior. The relevant claim is that one representation can reproduce a specified class of behaviors, outputs, or trajectories associated with another configuration. This relation is weaker than identity of mechanism and can be directional. A model may simulate an observed process over a restricted domain even when its internal variables have different interpretations or when several alternative models reproduce the same observed pattern.

Definition 21.590 (Behavioral simulation relation). A representation *A* *simulates* a representation or empirical process *B* over a stated domain when a specified mapping of inputs, states, or conditions permits *A* to reproduce the selected outputs, transitions, or trajectories of *B* within an explicit criterion of correspondence.

The correspondence criterion can involve exact equality, qualitative ordering, distributional similarity, bounded error, invariant pattern, event sequence, or another problem-specific standard. The criterion should be specified before the simulation is treated as evidence of equivalence. A model that reproduces an aggregate growth rate has established less than a model that also reproduces distributional dynamics, institutional transitions, and path-sensitive responses to intervention.

Definition 21.591 (Simulation domain). The *simulation domain* is the set of inputs, states, interventions, temporal horizons, scales, and observables over which a simulation-equivalence claim has been evaluated.

Proposition 21.592 (Simulation-domain condition). *A simulation-equivalence claim should not be extended beyond its evaluated domain without an additional warrant connecting the tested and untested conditions.*

This discipline is important for economic theory. Two models can match historical data under observed policy regimes while diverging under counterfactual interventions. Two agent-based systems can generate similar macro-patterns through different micro-rules. A reduced-form relation can predict within a stable regime while failing after institutional change. Simulation therefore establishes behavioral correspondence under conditions, not mechanism identity.

Proposition 21.593 (Simulation–mechanism separation). *Successful simulation of a selected behavior does not by itself establish that the simulator and the simulated configuration share the same causal mechanism, ontology, or internal organization.*

The distinction has a direct GRE implication. A generative-relational model can be evaluated by whether it reproduces observed trajectories or transition patterns, yet empirical fit alone cannot establish that the model's relational objects correspond uniquely to the underlying social reality. The epistemic inverse problem remains. Multiple relational configurations may generate similar manifestations, and a simulation can therefore be empirically useful while ontologically underdetermined.

Proposition 21.594 (Simulation-comparison condition). *Where several models simulate the same target behavior, comparative evaluation should use additional evidence concerning mechanism, intervention response, historical fit, scale transfer, and evidential traceability before stronger equivalence claims are made.*

21.26.4 Bisimulation

Bisimulation strengthens behavioral comparison by requiring reciprocal matching of admissible transitions. It is useful where the object of analysis is a process rather than a static state and where each configuration contains several possible next steps. Economic applications can include institutional transition systems, bargaining processes, adaptive strategies, platform-rule changes, policy regimes, or other situations in which the structure of possible evolution matters.

Definition 21.595 (Bisimulation relation). *A bisimulation relation between two state-transition representations relates states whose designated observables correspond and for which each admissible transition from either related state can be matched by a designated transition from the other representation leading to states that remain related under the same criterion.*

Bisimulation is therefore reciprocal and recursive. Matching an initial state and one subsequent outcome is insufficient. The relation must continue through the transitions included in the equivalence signature. This makes bisimulation particularly demanding when theories differ in the set of possible events they recognize.

Proposition 21.596 (Reciprocal-transition condition). *A bisimulation claim requires reciprocal transition matching for the transition classes included in the equivalence signature; one-directional reproduction supports simulation rather than bisimulation.*

The distinction between simulation and bisimulation helps clarify theoretical comparison across dynamic models. Suppose one model allows an institution to move among three governance regimes while another aggregates two regimes into one. The coarser model may simulate selected observed sequences. Full bisimulation can fail because a transition visible in the richer model has no distinct counterpart in the coarser state space. The failure identifies a material loss rather than a defect in either model.

Definition 21.597 (Dynamic equivalence boundary). *A dynamic equivalence boundary is the set of state distinctions, transition classes, temporal resolutions, and intervention types beyond which reciprocal transition matching ceases to hold.*

Dynamic equivalence can also depend on temporal resolution. Two systems can appear equivalent when observed annually and diverge when monthly adjustment, delay, sequencing, or fast-slow coupling becomes visible. Similarly, two models can generate comparable long-run attractors while differing in transition risk, path dependence, or distribution of transient costs.

Proposition 21.598 (Temporal-resolution condition). *A dynamic-equivalence claim should state the temporal resolution at which transitions are compared because aggregation over time can conceal transition differences that are material to explanation or intervention.*

Bisimulation therefore provides a rigorous language for a limited class of cross-theoretical claims. It is most informative when both theories represent states and transitions explicitly. Its use becomes metaphorical when transition spaces, observables, or correspondence rules remain unspecified.

21.26.5 Functional Equivalence

Functional equivalence compares what differently constituted objects or arrangements contribute within a system. Section 21.25.2 introduced functional translation; the present subsection raises the stronger question of when two translated arrangements can be treated as equivalent with respect to a specified function. Such claims are common in economics because institutions with different internal architectures can provision similar goods, coordinate similar transactions, stabilize similar expectations, or satisfy similar regulatory objectives.

Definition 21.599 (Functional equivalence). Two arrangements are *functionally equivalent* within a stated domain when they satisfy the same explicitly defined system function to the required performance criterion under the conditions included in the equivalence signature.

A market, cooperative, public agency, household, or commons arrangement can sometimes provide access to a similar service. A formal contract and a trust relation can sometimes support repeated exchange. Alternative payment infrastructures can sometimes settle the same transaction. Functional equivalence allows such comparisons without assuming common ownership, authority, incentive, or historical structure.

Definition 21.600 (Functional performance envelope). A *functional performance envelope* specifies the environmental conditions, demand range, resource conditions, temporal horizon, scale, reliability threshold, and affected positions over which two arrangements are claimed to perform the same function adequately.

The performance envelope matters because functional equivalence can disappear under stress or scale change. Two provisioning systems can serve ordinary demand equally well while differing under crisis. Two coordination mechanisms can perform similarly at small scale while generating different congestion, exclusion, or governance problems at larger scale. An arrangement can also satisfy an aggregate function while distributing burdens differently.

Proposition 21.601 (Functional-distribution condition). *Aggregate functional equivalence should be separated from equivalence in the distribution of costs, benefits, authority, risk, recognition, and future capability among affected positions.*

This distinction is important for GRE because generative consequences can differ even when immediate function is equivalent. Two educational arrangements can produce comparable measured attainment while generating different networks, confidence, institutional access, or future opportunity. Two energy systems can deliver comparable electricity while producing different ecological burdens and infrastructural lock-in. Two digital platforms can provide comparable matching services while creating different dependencies and data-control structures.

Proposition 21.602 (Functional-generative separation). *Functional equivalence at one time horizon does not establish equivalence in downstream generative effects unless the relevant future relations, capabilities, constraints, and conversion pathways are also included in the equivalence signature.*

Functional equivalence is therefore valuable precisely because it can support institutional comparison while leaving mechanism and consequence open for further

inquiry.

21.26.6 Manifestational Equivalence

Manifestational equivalence is especially important for the epistemology developed in earlier GRE chapters. Economic inquiry generally encounters manifestations: prices, survey responses, administrative categories, measured output, observed transactions, reported preferences, network traces, accounting records, textual artifacts, or experimental behavior. Distinct relational configurations can produce the same manifestation under a particular observation procedure. Equivalence at the level of manifestation therefore requires explicit separation from equivalence at the level of relational reality.

Definition 21.603 (Manifestational equivalence). Two configurations are *manifestationally equivalent* relative to an observation regime when the designated measurement, classification, or observation procedures cannot distinguish them with respect to the observables included in the equivalence signature.

The phrase “relative to an observation regime” prevents observational sameness from becoming an unrestricted claim. Equal income can conceal different wealth, household obligations, public-service access, capability conversion, or exposure to ecological risk. Equal employment status can conceal different autonomy, contract security, algorithmic control, or care burden. Equal prices can arise under different ownership structures or bargaining relations. Equal measured output can coexist with different unpaid work, ecological throughput, or distributional incidence.

Definition 21.604 (Observation regime). An *observation regime* is the combination of categories, instruments, sampling procedures, measurement resolution, data-generating institutions, and inferential conventions through which manifestations become available to inquiry.

Proposition 21.605 (Manifestation-underdetermination condition). *Manifestational equivalence provides evidence of indistinguishability under the stated observation regime and leaves the underlying relational configuration underdetermined unless additional evidence identifies it.*

This proposition applies equally to theories. Two theories can generate observationally equivalent predictions over the available data while differing in latent variables, mechanisms, or counterfactual implications. More evidence can sometimes separate them; in other cases, the available observation regime may leave the difference unresolved.

Manifestational equivalence also has a reflexive dimension. Measurements can change the configurations they record. Rankings can reorganize organizational behavior; eligibility categories can alter participation; platform metrics can redirect attention; risk scores can change access to credit. Where measurement becomes consequential, an observation regime is part of the relational configuration rather than an external window onto it.

Proposition 21.606 (Reflexive-observation condition). *When an observation regime causally changes the configuration being observed, manifestational equivalence should be assessed together with the feedback generated by the measurement, classification, or*

publication process.

The GRE contribution is therefore methodological restraint. Similar manifestations can justify comparison, while inference to common relational reality requires a further evidential step.

21.26.7 Role Equivalence

Role equivalence compares positions by the relations they sustain to other positions within an architecture. Two actors, institutions, or theoretical objects can occupy comparable roles even when their intrinsic characteristics and immediate counterparts differ. The concept is useful for cross-domain comparison because many economic functions depend on relational position: intermediary, residual claimant, guarantor, gatekeeper, caregiver, standard setter, broker, lender of last resort, platform operator, or commons monitor.

Definition 21.607 (Role equivalence). Two positions are *role-equivalent* within a specified relational architecture when they sustain the same designated pattern of relation types, obligations, permissions, dependencies, or transformation capacities relative to the classes of counterpart positions included in the equivalence signature.

Role equivalence is less demanding than direct relational identity. Two intermediaries can connect different actors while occupying a comparable brokerage role. Two institutions can enforce different substantive rules while occupying a similar rule-authorizing position. A public regulator and a platform operator can each possess gatekeeping capacity over access within different governance architectures, while their legal authority and accountability remain distinct.

Definition 21.608 (Role context). A *role context* is the relational boundary, counterpart classes, rule environment, scale, and temporal conditions within which a role-equivalence claim is evaluated.

Proposition 21.609 (Role-context condition). *A role-equivalence claim should remain indexed to its role context because the same position can occupy different roles across domains, scales, institutions, or historical periods.*

Role equivalence is particularly useful for theoretical translation. A “firm” in one theory and an “organization” in another can occupy comparable coordinating positions for a specific question. A “class position” and a “network position” can each identify structured advantage while encoding different mechanisms. A “capability converter” and an “institutional access point” can play comparable enabling roles without sharing the same normative meaning.

Proposition 21.610 (Role–mechanism separation). *Role equivalence does not establish equivalence of the mechanisms through which the compared positions acquire, exercise, reproduce, or legitimate their roles.*

The distinction matters for power analysis. Similar gatekeeping roles can arise through property, law, technical standards, expertise, social recognition, infrastructure, or dependence. Treating the roles as equivalent can support comparative analysis while preserving the different sources and consequences of power.

Proposition 21.611 (Role-transfer condition). *An inference transferred across role-equivalent positions requires an additional warrant whenever the inference depends*

on attributes, mechanisms, histories, or normative statuses outside the shared role signature.

21.26.8 Limits of Equivalence Claims

The preceding relations provide a vocabulary for stronger comparison after translation. Their value depends on disciplined stopping. Equivalence becomes misleading when a preserved local property is allowed to stand for an entire theory, when a coarse observational match is treated as mechanism identity, or when equivalence at one scale and time horizon is silently transferred to another. The final task of this section is therefore to specify an audit for the scope and ceiling of equivalence claims.

Definition 21.612 (Equivalence warrant). An *equivalence warrant* is the evidence and argument establishing that a specified equivalence relation preserves its declared signature within the stated domain, scale, temporal horizon, observation regime, and inferential purpose.

The warrant differs by relation. Isomorphism requires demonstrated structural preservation and reflection. Homomorphism requires preservation of the selected structure plus an account of collapsed distinctions. Simulation requires behavioral correspondence over a tested domain. Bisimulation requires reciprocal transition matching. Functional equivalence requires a defined performance envelope. Manifestational equivalence requires an observation regime. Role equivalence requires a relational role context.

Definition 21.613 (Equivalence profile). An *equivalence profile* records, for a pair of compared configurations, which equivalence relations are supported, the signatures and domains for which they hold, and the principal remainders that remain outside each claim.

An equivalence profile avoids forcing a pair of theories into one binary judgment. Two models can be functionally equivalent, manifestationally equivalent over current data, and structurally non-isomorphic. Two institutions can be role-equivalent while dynamically non-bisimilar. Two representations can be structurally isomorphic while carrying different normative interpretation. The profile records this plurality rather than compressing it into “equivalent” or “different.”

Proposition 21.614 (Equivalence-plurality condition). *Different equivalence relations may hold simultaneously or fail independently for the same pair of configurations; evidence for one relation supplies no automatic warrant for another.*

Equivalence can also be local in scale and time. Aggregation can create equivalence by averaging away differences. Disaggregation can reveal previously hidden divergence. Institutional change can break a relation that held under an earlier rule environment. Learning, adaptation, ecological degradation, technological change, or power shifts can alter the mappings on which the equivalence depended.

Proposition 21.615 (Scale–time locality). *An equivalence established at one analytical scale, temporal resolution, or historical configuration should be treated as local to that domain unless a separate argument supports transfer across scale or time.*

Intervention creates an additional test. Two configurations can be observationally equivalent under existing conditions and respond differently when policy, technol-

ogy, ownership, or institutional rules change. Intervention response can therefore reveal distinctions hidden by passive observation.

Definition 21.616 (Intervention-sensitive equivalence). An equivalence relation is *intervention-sensitive* when its preservation depends on the class of interventions applied to the compared configurations.

Proposition 21.617 (Intervention-stability condition). *Where an equivalence claim is used to justify policy transfer or institutional substitution, the warrant should include evidence that the claimed equivalence remains adequate under the relevant intervention class.*

Normative interpretation also sets a ceiling. Equivalent outputs can coexist with unequal burdens, rights, recognition, ecological consequences, or future opportunities. A mapping can be technically exact while omitting the dimension on which the normative dispute turns.

Definition 21.618 (Normative equivalence remainder). The *normative equivalence remainder* is the set of morally or politically relevant distinctions excluded from the equivalence signature but potentially material to evaluation or institutional choice.

Proposition 21.619 (Normative-remainder condition). *A positive equivalence claim on structural, behavioral, functional, manifestational, or role grounds should not be used as a normative equivalence claim unless the evaluative dimensions relevant to the judgment are themselves included and warranted.*

The same restraint applies to ontology. The book's ontological suspension means that formal equivalence among representations cannot establish that the represented entities possess identical ultimate being. It can establish that specified relations, behaviors, or manifestations are interchangeable for a defined analytical purpose.

Definition 21.620 (Equivalence ceiling). An *equivalence ceiling* is the strongest equivalence relation warranted by the available structure, evidence, domain conditions, and stated analytical purpose after translation loss and relevant remainders have been assessed.

Proposition 21.621 (Equivalence-ceiling discipline). *Cross-theoretical comparison should state the strongest equivalence relation actually warranted and retain weaker or non-equivalent translation where stronger preservation has not been established.*

The equivalence ceiling supplies a practical decision rule for the chapter. A conceptual translation may support role equivalence while leaving structure unresolved. A structural translation may support homomorphism while failing isomorphism. A simulation may support prediction over an observed regime while leaving bisimulation and mechanism equivalence unsupported. Manifestational equivalence may remain the strongest available claim when underlying configurations cannot be identified.

This hierarchy also clarifies why identity is an unnecessarily strong destination for much theoretical dialogue. Economic theories can share structures, functions, behaviors, manifestations, or roles while retaining different objects, causal stories, temporalities, normative commitments, and evidential practices. Those differences can be analytically productive. Equivalence provides a way to state what can travel between theories; the remainder records what should continue to resist substitution.

Proposition 21.622 (Equivalence-without-identity principle). *A warranted equiva-*

lence establishes substitutability only with respect to its declared signature and domain; theoretical identity requires additional preservation claims beyond the equivalence relation itself.

The principle completes the progression from Section 21.25. Translation establishes intelligibility. Equivalence establishes a stronger, explicitly indexed preservation relation. Identity remains a separate claim. The next section turns to cases in which even carefully scoped equivalence leaves substantive disagreements that should remain visible rather than being converted into stronger synthesis.

21.27 Irreducible Theoretical Disagreement

Sections 21.25 and 21.26 established two increasingly demanding forms of cross-theoretical relation: translation and scoped equivalence. The role of the present section is to identify the boundary beyond which improved translation or stronger equivalence warrants do not dissolve substantive disagreement. Its objective is to distinguish disagreements that arise from constitutive commitments concerning ontology, epistemic warrant, normative evaluation, method, historical constitution, and value, and to specify how such disagreements can remain analytically productive. The discussion proceeds through these six sites of disagreement before developing a practice of productive persistence and a protocol for preserving incommensurability. The method is metatheoretical and comparative. It treats disagreement neither as evidence of intellectual failure nor as a reason to abandon comparison; it asks which commitments would have to change for apparent disagreement to disappear and whether those commitments are constitutive of the theories being compared.

Translation can fail because vocabulary is incomplete, evidence is sparse, scales differ, or one representation is too coarse. Such failures are potentially repairable. A different situation arises when two theories can understand one another sufficiently well and still give incompatible answers because they organize inquiry through different constitutive commitments. A theory that treats preferences as analytically given for a specified problem and a theory that treats preference formation as part of the explanatory object may produce different accounts even after their terms are translated carefully. A theory that evaluates institutions by welfare consequences and a theory that evaluates them through capabilities, recognition, ecological integrity, or democratic standing can share empirical descriptions while retaining distinct evaluative judgments. The remaining disagreement is substantive because further convergence would require revision of the commitments that make the theories the theories they are.

Definition 21.623 (Constitutive theoretical commitment). A *constitutive theoretical commitment* is a commitment concerning analytical objects, admissible explanations, evidential warrants, normative standards, methodological procedures, historical scope, or value relations whose removal or reversal would materially alter the identity or explanatory architecture of a theory.

Constitutive commitments need not be immutable. Theories can revise them through criticism, new evidence, conceptual reconstruction, or historical change. The definition concerns their current structural role. A disagreement becomes especially important when resolution is available only by asking one side to surrender such a commitment while the other side remains unchanged.

Definition 21.624 (Irreducible theoretical disagreement). An *irreducible theoretical disagreement* is a disagreement that persists after adequate conceptual translation, relevant evidential clarification, and appropriate scope specification because the compared theories retain incompatible constitutive commitments within the domain under examination.

The word “irreducible” is therefore local and revisable. It does not mean eternally irresolvable. It records that, given the present theories and available warrants, the disagreement cannot be removed by terminological substitution, improved measure-

Table 21.27: Sites of irreducible theoretical disagreement and their preservation requirements

Site	Constitutive question	Evidence of irreducibility	Preservation requirement
Ontological	Which kinds of entities, relations, processes, or structures enter the theory's account of economic reality?	Translation leaves incompatible commitments about what the explanatory objects are or what status they possess	Keep ontological assertions, suspensions, and modeling conveniences explicitly separated
Epistemic	What counts as warranted knowledge about the economic object?	Theories accept different evidence or inferential standards even after observing the same manifestations	Record observation regimes, inferential warrants, and underdetermination
Normative	Which evaluative standards govern judgment?	Shared empirical description supports different evaluations because the standards themselves differ	State evaluative dimensions and retain normative remainders
Methodological	Which procedures are adequate for producing or testing explanations?	Disagreement concerns the relation between question, method, and admissible inference rather than technique alone	Preserve method-question coupling and limits of transfer
Historical	Which categories are historically constituted, and over what temporal domain can they travel?	A category treated as portable by one theory is treated as historically specific by another	Index claims to historical conditions and transformation pathways
Value	What constitutes value, how is it expressed, and what conversions are legitimate?	Theories retain incompatible value grammars or refuse a common measure on material dimensions	Preserve plural value forms and the boundaries of commensuration

ment, or a stronger mapping without changing constitutive commitments.

Proposition 21.625 (Translation-exhaustion condition). *A disagreement should be classified as irreducible only after plausible translation errors, scale mismatches, evidential ambiguities, and differences in stated scope have been examined sufficiently to show that the remaining conflict concerns constitutive theoretical commitments.*

This condition prevents premature declarations of incommensurability. Some disputes that appear philosophical are generated by different units of analysis, observation windows, or meanings assigned to the same word. Section 21.25 supplies the translation audit; Section 21.26 supplies the equivalence audit. The present section begins where those procedures leave a material remainder. Table 21.27 summarizes the six principal sites of disagreement and the preservation requirement associated with each.

21.27.1 Ontological Disagreement

Ontological disagreement concerns the status of the objects through which theories construct the economic world. The relevant differences can concern whether individuals, classes, institutions, relations, fields, capabilities, ecosystems, technologies, or processes are treated as primary explanatory objects; whether aggregate categories are reducible to lower-level objects; and whether a formal representation is interpreted realistically, instrumentally, or heuristically. These differences can remain after extensive conceptual translation because the theories assign different explanatory standing to the translated objects.

Definition 21.626 (Ontological register). An *ontological register* is the set of entity, relation, process, structure, event, property, and state categories to which a theory assigns explanatory standing, together with the status the theory attributes to those categories.

Two theories can use similar words while operating in different ontological registers. “Individual” can denote a preference-bearing decision unit, an embodied and dependent person, a position constituted through social relations, or an evolving agent whose characteristics change through interaction. “Institution” can denote a rule constraint, a historically formed practice, an organization, a governance arrangement, or a relationally stable configuration. Translation can align these uses sufficiently for dialogue while leaving disagreement about their explanatory priority or status.

Definition 21.627 (Ontological disagreement). An *ontological disagreement* occurs when theories retain incompatible commitments about the explanatory objects or ontological status relevant to a shared economic question after their terms and scopes have been adequately clarified.

Ontological disagreement is especially easy to overstate. Different formalisms do not automatically imply different ontologies. A network, field, game, optimization problem, or dynamical system can serve as a representation without asserting that economic reality ultimately consists of the mathematical objects in the representation. Conversely, ontological disagreement can remain even when two theories employ similar mathematical structures if they interpret the represented objects differently.

Proposition 21.628 (Representation–ontology separation). *Formal similarity or formal difference should not be used as sufficient evidence of ontological agreement or disagreement unless the compared theories explicitly connect the formal objects to claims about the status of the represented economic objects.*

GRE’s own response is ontological suspension. The framework can model relations, fields, histories, events, or spacetime-like structures where these representations are analytically useful while withholding a claim that any one representation exhausts ultimate ontology. This stance does not eliminate ontological disagreement with theories that make stronger ontological claims. It changes the form of the disagreement: GRE can often translate and work with the objects while declining to adopt the stronger ontological commitment.

Proposition 21.629 (Suspension-preservation condition). *Where one theory suspends an ontological commitment that another theory affirms, translation should preserve the difference between affirmation and suspension rather than representing suspension as*

tacit agreement or denial.

This condition matters throughout the comparative sections. A relational reconstruction can show how a class, preference, institution, capability, ecosystem, or platform becomes analyzable within GRE without asserting that the source theory and GRE share the same ontology. Ontological dialogue is therefore possible without ontological merger.

21.27.2 Epistemic Disagreement

Epistemic disagreement concerns the warrants through which a theory treats an economic claim as knowable, credible, or sufficiently supported. The dispute can involve observational categories, causal identification, interpretation, historical reconstruction, model adequacy, counterfactual reasoning, testimony, ethnographic evidence, experimental control, measurement, or formal proof. Methodological differences become epistemic disagreements when the theories differ about what a method can establish and what kinds of evidence should alter belief.

Definition 21.630 (Epistemic warrant architecture). An *epistemic warrant architecture* is the organized relation among admissible evidence, observation regimes, inferential procedures, standards of adequacy, uncertainty treatment, and revision rules through which a theory supports or revises claims.

The same manifestation can carry different epistemic force across theories. A stable revealed choice can be treated as evidence concerning preference within one analytical framework, while another framework may regard the same choice as underdetermined because institutional constraint, social expectation, adaptive preference, or power remains unobserved. A randomized intervention can provide a strong local causal estimate while leaving a historical theory's question about institutional formation largely untouched. A historical sequence can be central evidence for a path-dependent explanation while being peripheral to a model whose object is a local equilibrium relation.

Definition 21.631 (Epistemic disagreement). An *epistemic disagreement* occurs when theories retain incompatible standards concerning what evidence warrants a claim, what inferential moves are admissible, or what uncertainty remains material after examining the same relevant manifestations.

Epistemic disagreement can survive agreement on data. Two theories can accept the same observations and disagree over whether the observations identify a mechanism, reveal a preference, justify generalization, support a historical interpretation, or warrant intervention. The disagreement therefore concerns the path from manifestation to claim.

Proposition 21.632 (Shared-data insufficiency). *Agreement on an empirical dataset does not establish epistemic agreement when the compared theories retain different observation models, identification assumptions, standards of generalization, or rules for revising claims.*

GRE's inverse-problem epistemology makes this issue especially visible. Manifestations can be compatible with multiple relational configurations, as discussed in Section 21.26. Yet GRE should not convert that underdetermination into a blanket

skepticism about empirical identification. Different research designs reduce different forms of underdetermination. The relevant disagreement concerns how much has been identified and what remains outside the evidential reach of the design.

Proposition 21.633 (Epistemic-remainder condition). *Cross-theoretical comparison should record which claims are supported by shared evidence and which claims remain dependent on theory-specific inferential warrants after the evidence has been considered.*

Preserving this remainder allows empirical dialogue to proceed without requiring one epistemology to absorb the other. A theory can learn from evidence generated under another methodology while retaining a different account of what further evidence is required.

21.27.3 Normative Disagreement

Normative disagreement arises when theories differ in the evaluative standards through which economic arrangements, outcomes, processes, or relations are judged. Welfare, freedom, capability, need, rights, equality, recognition, democratic standing, ecological integrity, care, reciprocity, and future generativity can each serve as evaluative dimensions. Their relationships can be partially aligned in specific cases while remaining conceptually distinct.

Definition 21.634 (Normative criterion set). *A normative criterion set is the collection of evaluative dimensions, priority rules, admissible trade-offs, affected subjects, and procedural commitments through which a theory or evaluative framework judges an economic configuration.*

A normative criterion set need not be a complete moral theory. It can be local to an economic problem. A welfare analysis may evaluate preference satisfaction under specified constraints. A capability analysis can ask which substantive opportunities people possess. Feminist and care approaches can evaluate dependency relations, recognition, and the distribution of reproductive burdens. Ecological economics can introduce duties concerning ecological limits and intergenerational effects. Commons and cooperative approaches can foreground participation, reciprocity, or collective self-governance. These criteria can converge on a policy recommendation while doing so for different reasons.

Definition 21.635 (Normative disagreement). *A normative disagreement occurs when theories or evaluative frameworks retain incompatible judgments because their normative criterion sets assign different standing, priority, or permissible trade-offs to materially relevant evaluative dimensions.*

The disagreement is irreducible at the present stage when additional factual agreement would not determine the evaluative judgment. Better evidence can reveal who bears a burden, how large an effect is, or which alternatives are feasible. It cannot by itself establish whether aggregate welfare, equal standing, ecological preservation, capability protection, democratic participation, or some other criterion should govern the judgment.

Proposition 21.636 (Fact–criterion separation). *Where theories agree on the relevant empirical description but differ in their normative criterion sets, additional descriptive*

evidence alone does not resolve the evaluative disagreement unless it changes the applicability or interpretation of the criteria themselves.

GRE's heterogeneous-value architecture increases the need for restraint. Generativity can be economically important without becoming a universal normative maxim. An intervention that expands future possibilities for one group can restrict them for another, increase ecological burden, deepen dependency, or weaken recognition. The normative problem therefore requires explicit judgment about whose generativity, which relations, what time horizon, and which constraints matter.

Proposition 21.637 (Generativity–normativity separation). *A finding that an arrangement increases generative capacity or expands a future possibility set does not by itself establish normative priority over competing claims concerning rights, justice, care, ecological limits, recognition, or the distribution of burdens and opportunities.*

Normative disagreement should consequently remain visible even when GRE can translate the competing standards into a common relational description. Common description creates a site for argument; it does not supply the missing normative premise.

21.27.4 Methodological Disagreement

Methodological disagreement concerns the relation between a research question and the procedures considered adequate for answering it. Economics contains formal, econometric, experimental, historical, comparative, ethnographic, institutional, computational, accounting, network, and interpretive methods. Many disagreements among them are practical rather than irreducible: more data, improved design, or clearer assumptions can often reconcile results. Irreducible methodological disagreement appears when theories differ about what the research object requires a method to preserve or disclose.

Definition 21.638 (Method–object coupling). *Method–object coupling* is the relation between a method's operations and the features of the research object that the method is expected to identify, preserve, estimate, interpret, or reconstruct.

A method adequate for estimating a local treatment effect can be poorly matched to a question about the historical production of the treatment category. A formal model can clarify consistency conditions while leaving empirical parameterization open. Ethnography can reveal meaning and situated practice while offering a different basis for generalization than a large-sample design. Agent-based simulation can explore generative mechanisms under explicit rules while leaving the empirical adequacy of those rules to separate investigation. Methodological pluralism therefore begins with specification of the object and inferential task.

Definition 21.639 (Methodological disagreement). *A methodological disagreement* occurs when theories retain incompatible judgments about which features of an economic object must be preserved or identified for a method to count as adequate to a stated research question.

The disagreement can concern aggregation, abstraction, controllability, reproducibility, contextuality, historical sequence, causal identification, or interpretive meaning. It becomes irreducible when changing the methodological standard would

alter what the theory recognizes as the research object or as an adequate explanation.

Proposition 21.640 (Local-method adequacy). *Methodological comparison should evaluate a method relative to a specified research object, inferential task, scale, and evidential environment rather than infer general epistemic superiority from success in another domain.*

This proposition implements the methodological pluralism developed earlier in the book. It also prevents pluralism from becoming indiscriminate acceptance. A method can be inadequate to a particular question. The point is that adequacy must be argued through the method–object coupling rather than through disciplinary prestige or a universal hierarchy of methods.

Proposition 21.641 (Methodological-conflict audit). *Where methods yield conflicting conclusions, comparison should distinguish disagreement generated by data, assumptions, identification strategy, scale, model closure, interpretive frame, and method–object coupling before treating the conflict as irreducible.*

A productive methodological disagreement can then specify what each approach sees and what it systematically leaves unresolved. This prepares the multi-theoretical explanation developed in Section 21.28.

21.27.5 Historical Disagreement

Historical disagreement concerns whether economic categories, mechanisms, and regularities are portable across historical configurations. Some theories intentionally abstract from historical formation to identify relations that hold under a specified model. Other theories make historical constitution part of the explanatory object: markets, firms, classes, households, property, labor, money, preferences, technologies, or states acquire their economic meaning through historically specific institutions and relations. Both strategies can be analytically useful, yet they support different claims about transfer across time.

Definition 21.642 (Historical scope condition). *A historical scope condition specifies the institutional, technological, legal, ecological, political, cultural, and relational configuration within which a theoretical category or mechanism is claimed to retain its meaning and explanatory adequacy.*

Historical scope differs from a date range. A mechanism can recur across periods when the relevant relational conditions recur. A category can cease to travel even across adjacent periods when its constitutive institutions change. Digital platforms, for example, can alter the informational and contractual environment of intermediation without eliminating older market mechanisms. Care relations can persist while household, labor-market, and welfare institutions transform their distribution. Historical analysis therefore asks which relations reproduce the category and which changes modify its explanatory content.

Definition 21.643 (Historical disagreement). *A historical disagreement occurs when theories retain incompatible commitments concerning the historical constitution, temporal portability, or transformation of categories and mechanisms relevant to a shared economic question.*

One theory may treat a category as a stable analytical primitive over the problem

domain, while another treats its formation as endogenous to the history being explained. The disagreement cannot be resolved merely by attaching a historical example to the first theory or by redescribing the second theory in abstract variables. The constitutive role of history differs.

Proposition 21.644 (Historical-indexing condition). *A cross-theoretical claim that transfers a category or mechanism across historical configurations should state the relations and institutions whose persistence is required for that transfer to remain warranted.*

GRE's own historical orientation does not entail that every analysis must reconstruct the full genealogy of its objects. Local abstraction can be legitimate when historical change is outside the question or sufficiently slow relative to the analytical horizon. Historical disagreement becomes material when the omitted history changes the mechanism, the subject, the institutional boundary, or the future trajectory relevant to the claim.

Proposition 21.645 (Historical-materiality condition). *Historical disagreement is analytically material when alternative historical constitutions would change the meaning, mechanism, admissible comparison, or downstream generative consequences of the economic object under examination.*

This condition prevents history from becoming ceremonial context. History enters the explanation where sequence and constitution change what the theory can validly say.

21.27.6 Value Disagreement

Value disagreement is broader than normative disagreement. Economic theories use "value" to identify different objects: exchange value, utility, labor-mediated value relations, capabilities, care, ecological values, relational goods, social meaning, monetary valuation, or generative effects. Some of these are explanatory categories, some are measures, some are evaluative standards, and some concern the institutional process through which heterogeneous qualities are converted into commensurable forms. Dialogue becomes distorted when these distinct uses are translated into one scalar vocabulary too early.

Definition 21.646 (Value grammar). *A value grammar is the theory-specific organization of value-bearing objects, value relations, measures, conversion rules, commensuration procedures, evaluative meanings, and institutional conditions through which value claims become intelligible.*

A value grammar can permit exact commensuration for one purpose and reject it for another. Market prices can provide a monetary comparison without exhausting ecological, capability, care, recognition, or relational significance. A capability index can support multidimensional comparison while leaving contested weighting choices visible. Marxian value categories can organize an account of capitalist production without becoming interchangeable with welfare valuation. GRE's heterogeneous-value vocabulary is designed to keep these distinctions available for analysis.

Definition 21.647 (Value disagreement). *A value disagreement occurs when theories retain incompatible commitments concerning what bears value, how value is gener-*

ated or recognized, which conversions are legitimate, or which measures can represent the relevant value relations.

The strongest form appears where no common metric is warranted for the dimension under dispute. This does not imply that comparison is impossible. Ordinal comparison, threshold reasoning, dominance relations, procedural judgment, deliberation, or separate reporting can remain available. The disagreement concerns the legitimacy of a particular conversion or common measure.

Definition 21.648 (Local value incommensurability). *Local value incommensurability* is the absence, within a specified decision or analytical domain, of a warranted common measure that preserves the value distinctions material to the comparison.

Local incommensurability is deliberately weaker than a claim that values can never be compared. A decision can be made without reducing every dimension to one number. Institutions routinely combine thresholds, rights, budgets, deliberation, expert judgment, and plural indicators. The analytical requirement is to state what is converted, what remains separate, and who controls the conversion interface.

Proposition 21.649 (Commensuration-warrant condition). *A cross-theoretical value comparison should employ a common metric only when the conversion preserves the distinctions relevant to the stated purpose or when the losses introduced by the conversion are explicitly justified for that purpose.*

This condition links value disagreement to power. Commensuration rules can privilege actors able to define categories, prices, indicators, accounting boundaries, or data infrastructures. A disagreement over value can therefore concern both conceptual commensurability and institutional authority over conversion.

Proposition 21.650 (Value-conversion governance). *Where value disagreement is mediated through an institutional conversion rule, analysis should distinguish disagreement about the value grammar from disagreement about authority over the rule that performs the conversion.*

Preserving that distinction is central to GRE because heterogeneous value and power over conversion interfaces are analytically connected while remaining separate objects.

21.27.7 Productive Persistence of Disagreement

Irreducible disagreement need not terminate inquiry. Once the disagreement has been located precisely, it can improve theory by identifying hidden assumptions, revealing omitted objects, creating discriminating empirical questions, and showing where normative or methodological judgment enters an analysis. The appropriate aim can therefore be productive persistence: maintaining the disagreement in a form that generates further inquiry while preventing it from collapsing into rhetorical opposition.

Definition 21.651 (Productive persistence). *Productive persistence* is the continued coexistence of a specified theoretical disagreement under conditions that make its constitutive commitments, evidential consequences, domains of adequacy, and potential revision pathways explicit.

Productive persistence differs from simple stalemate. A stalemate merely records

incompatible positions. Productive persistence asks what each position predicts, notices, excludes, or evaluates differently; what evidence could revise a non-constitutive part of either theory; and which research questions arise precisely because the disagreement remains.

Definition 21.652 (Disagreement map). A *disagreement map* records the shared question, translated concepts, relevant equivalence relations, constitutive commitments in conflict, common evidence, theory-specific warrants, empirical discriminators, normative remainders, and revision conditions associated with a theoretical disagreement.

The map turns disagreement into research infrastructure. An ontological disagreement can motivate comparative formalizations that hold observations constant while varying object structure. An epistemic disagreement can motivate studies of transport, external validity, measurement, or historical reconstruction. A methodological disagreement can motivate triangulation across distinct access modes. A value disagreement can motivate explicit analysis of conversion losses and governance. A normative disagreement can identify where collective judgment remains necessary after empirical questions have been clarified.

Proposition 21.653 (Disagreement-generativity principle). *A theoretical disagreement is productively persistent when preserving the disagreement generates discriminating questions, new evidence, sharper scope conditions, or clearer normative choices that would be obscured by premature synthesis.*

This principle gives disagreement a generative role without romanticizing conflict. Some disagreements rest on error, incoherence, or obsolete evidence and should be revised. Productive persistence applies when the competing commitments remain sufficiently defensible and analytically fruitful to justify continued comparison.

Proposition 21.654 (Revision-openness condition). *Preserving an irreducible disagreement should remain compatible with revision when new evidence, conceptual analysis, or changed historical conditions undermine a constitutive commitment that previously sustained the disagreement.*

Irreducibility is therefore a present analytical diagnosis rather than a declaration of permanent incompatibility. The diagnosis can itself change as theories evolve.

21.27.8 Preserving Incommensurability

The final task is to preserve forms of incommensurability that carry material theoretical content while retaining the possibility of dialogue. Incommensurability is used here in a local and disciplined sense. It concerns dimensions for which a common measure, common criterion, or lossless mapping is presently unwarranted. It does not imply complete mutual unintelligibility. Section 21.25 already showed that partial translation can remain possible when equivalence fails; the same principle applies when some dimensions resist a common metric or criterion altogether.

Definition 21.655 (Theoretical incommensurability). Two theoretical commitments are *incommensurable relative to a specified dimension* when no currently warranted common measure, criterion, or preservation mapping represents that dimension without eliminating a distinction material to at least one of the theories.

The definition is explicitly dimension-specific. Two theories can be commensurable in prediction and incommensurable in normative evaluation. They can share a functional comparison while resisting a common value metric. They can translate each other's concepts while disagreeing about ontological status. They can be empirically distinguishable while retaining different standards concerning what would count as an adequate explanation.

Definition 21.656 (Incommensurability profile). An *incommensurability profile* records the dimensions on which common comparison is warranted, the dimensions on which comparison requires lossy conversion, and the dimensions on which a common measure or criterion should remain suspended.

The profile complements the equivalence profile of Section 21.26. Equivalence profiles state what can be preserved strongly. Incommensurability profiles state where preservation reaches its limit. Used together, they prevent both fragmentation and forced unity.

Proposition 21.657 (Partial-dialogue condition). *Incommensurability on one dimension does not preclude translation, empirical comparison, functional analysis, or cooperative inquiry on other dimensions for which adequate common relations can be established.*

This condition is important for economic pluralism. A welfare economist, capability theorist, ecological economist, feminist economist, institutionalist, and Marxian economist can investigate the same policy while disagreeing about the ultimate evaluative or explanatory register. Shared empirical work remains possible when the shared questions are specified. The disagreement should remain visible in the interpretation of the evidence and the criteria of judgment.

Definition 21.658 (Non-forced synthesis). *Non-forced synthesis* is a mode of theoretical coordination that combines compatible insights or explanations while leaving materially incommensurable commitments unmerged and explicitly represented.

The term identifies a boundary for GRE's translation language. Relational description can create common coordinates, yet common coordinates need not erase disagreement. A class relation can be represented relationally without converting it into a generic network tie. Care can be represented as a relation without exhausting its embodied and normative meaning. Ecological constraints can be represented as constraints on generative trajectories without converting ecological value into a generic possibility metric. Capability can be related to generative capacity without identifying the two concepts.

Proposition 21.659 (Anti-assimilation condition). *A relational translation should preserve a source theory's constitutive distinctions whenever eliminating those distinctions would convert substantive disagreement into apparent agreement by definitional absorption.*

The anti-assimilation condition is especially important for GRE because a sufficiently general relational vocabulary can redescribe many theories. Redescription is useful only when it remains capable of recording what the source theory contributes that the receiving framework does not already contain.

Definition 21.660 (Disagreement preservation protocol). A *disagreement preservation protocol* records, for a cross-theoretical comparison, the translated common

ground, the strongest warranted equivalences, the constitutive commitments still in conflict, the incommensurability profile, the evidence relevant to revision, and the dimensions that should remain separate in subsequent synthesis or application.

Proposition 21.661 (Preserved-disagreement principle). *Cross-theoretical dialogue is stronger when it preserves material disagreement explicitly than when it produces apparent unity by weakening, omitting, or redefining the commitments on which the disagreement depends.*

This principle completes the sequence begun in Sections 21.25 and 21.26. Translation identifies possible common language. Equivalence identifies dimensions of warranted substitutability. Irreducible disagreement identifies the constitutive remainder that survives those procedures. The resulting theoretical ecology can therefore contain common coordinates, local equivalences, and preserved incommensurabilities simultaneously.

The next section turns from disagreement itself to explanation. Multi-theoretical explanation can draw on several theories at complementary levels, scales, or historical layers without requiring their constitutive commitments to be fully synthesized. The disagreement preservation protocol established here supplies the boundary conditions for that combination.

21.28 Multi-Theoretical Explanation

Sections 21.25–21.27 established a sequence for cross-theoretical dialogue: translation can create common coordinates, equivalence can identify scoped preservation relations, and irreducible disagreement can remain when constitutive commitments continue to differ. The role of the present section is to determine how several economic theories can nevertheless contribute to one explanation. Its objective is to specify forms of multi-theoretical explanation that preserve level, scale, temporal, causal, and normative distinctions while permitting explanatory combination where the combination is warranted. The discussion proceeds through complementary levels, competing explanations, nested explanations, scale-specific explanations, historical layering, and explanatory pluralism before stating criteria for combination and limits of synthesis. The method is metatheoretical and constructive. It treats theoretical plurality as an explanatory resource only when the contribution of each theory, the relation among contributions, and the remaining disagreements are made explicit.

Economic phenomena routinely span more than one analytical register. A labor-market transition can involve individual search behavior, organizational routines, bargaining institutions, macroeconomic demand, technological change, household care arrangements, platform intermediation, and historically specific legal categories. A single theory may explain one or several of these relations well while leaving others outside its intended domain. Multi-theoretical explanation therefore concerns the disciplined coordination of partial explanations rather than the accumulation of theoretical labels around one case.

Definition 21.662 (Multi-theoretical explanation). A *multi-theoretical explanation* is an explanation of a specified economic phenomenon that assigns two or more theories distinct explanatory contributions and states the relations among those contributions, including their levels, scales, temporal domains, causal roles, evidential warrants, and remaining theoretical disagreements.

The definition requires assignment. Merely citing several traditions does not create a multi-theoretical explanation. Each theory must perform identifiable explanatory work. A behavioral account may identify a decision process; an institutional account may identify the rule structure within which the decision occurs; a political-economic account may identify the distribution of authority over that structure; and an ecological account may identify a biophysical boundary on the feasible trajectories. Their coexistence becomes explanatory only when the relations among these contributions are stated.

Definition 21.663 (Explanatory contribution). An *explanatory contribution* is the theory-indexed account of a specified object, relation, mechanism, condition, process, or evaluative consequence that materially reduces uncertainty about the phenomenon under examination within an identified domain.

Proposition 21.664 (Contribution-identification condition). A *multi-theoretical explanation* should identify the explanatory contribution of each participating theory before claiming that the theories jointly explain the phenomenon.

This condition prevents pluralism from becoming additive rhetoric. It also cre-

Table 21.28: Relations among theoretical contributions in multi-theoretical explanation

Relation	Explanatory role	Combination requirement	Principal risk
Level complementarity	Theories explain different levels of one phenomenon	Specify cross-level dependence and avoid duplicating the same mechanism	Level collapse or unexplained aggregation
Competing explanations	Theories explain the same target through materially different mechanisms	State discriminating evidence, scope, and possible coexistence	Premature averaging or false reconciliation
Nested explanations	One explanation operates within boundary conditions supplied by another	Specify containment, interfaces, and autonomy of the nested mechanism	Treating containment as reduction
Scale-specific explanations	Theories are adequate at different spatial, organizational, or temporal scales	State scale of validity and cross-scale transfer conditions	Extrapolation beyond the warranted scale
Historical layering	Theories explain mechanisms produced in different historical layers that coexist	Reconstruct sequence, persistence, and interaction among layers	Flattening historically distinct mechanisms
Plural explanatory architecture	Several irreducible contributions jointly constrain the account	Record contribution map, warrants, and preserved disagreement	Unstructured eclecticism or forced synthesis

ates the basis for testing whether two contributions are complementary, competing, nested, scale-specific, historically layered, or incompatible. Table 21.28 summarizes these principal relations.

21.28.1 Complementary Levels

Complementary-level explanation applies when theories illuminate different levels of organization within a common phenomenon. An individual-level model can explain how agents respond to incentives or uncertainty; an organizational theory can explain routines and authority; an institutional theory can explain rules and enforcement; a macroeconomic theory can explain aggregate demand or financial conditions; and a relational or political-economic account can explain how power shapes the interfaces among these levels. Complementarity arises when the contributions concern different explanatory objects and the relations among those objects are material to the outcome.

Definition 21.665 (Explanatory level). An *explanatory level* is a relatively stable analytical stratum at which a theory identifies objects, relations, mechanisms, or regularities whose explanatory adequacy depends on treating that stratum as locally coherent for the question under examination.

Levels are question-relative rather than metaphysically fixed. A household can be treated as an aggregate actor in one inquiry and as an internally differentiated field

of bargaining, care, dependency, and resource conversion in another. A firm can appear as a production unit, a nexus of contracts, an organization with routines, a governance structure, a site of class relations, or a network position. Multi-theoretical explanation should therefore justify the level at which each contribution operates.

Definition 21.666 (Level complementarity). Two explanatory contributions exhibit *level complementarity* when they address causally or constitutively connected levels of the same phenomenon and neither contribution duplicates the explanatory role assigned to the other.

Complementarity does not imply harmony among theories. A theory of household choice and a feminist account of intra-household power can be jointly useful while disagreeing about how preferences are formed or which unit should be treated as primary. The multi-theoretical explanation can preserve that disagreement while assigning each theory a local task.

Proposition 21.667 (Cross-level interface condition). *A complementary-level explanation should specify the interface through which states, actions, constraints, or transformations at one level affect the explanatory objects identified at another level.*

Without an interface, levels are merely juxtaposed. Cross-level interfaces can include contracts, prices, rules, organizational authority, budgets, infrastructures, classification systems, household transfers, ecological flows, or data-mediated controls. The relevant interface depends on the problem.

Proposition 21.668 (Aggregation-accountability condition). *Where an explanation moves from lower-level relations to an aggregate outcome, the aggregation rule or causal pathway should be stated rather than inferred from the coexistence of lower-level mechanisms.*

This condition is particularly important when individual actions interact nonlinearly, when institutions filter or transform local effects, or when aggregate variables possess dynamics that cannot be reconstructed by simple summation. Complementary levels expand explanatory coverage only when their coupling is made analytically visible.

21.28.2 Competing Explanations

Multi-theoretical inquiry also encounters theories that explain the same target through materially different mechanisms. Unemployment can be attributed to search frictions, insufficient effective demand, bargaining institutions, technological displacement, sectoral restructuring, or historically specific configurations of investment and power. Firm boundaries can be explained through transaction costs, property rights, capabilities, routines, network coordination, or platform architecture. Such explanations should not be declared complementary simply because several mechanisms are plausible.

Definition 21.669 (Competing explanation). Two explanations *compete* when they assign materially different causal, constitutive, or functional accounts to the same explanandum within overlapping scope conditions such that evidence bearing on one account can alter the warranted standing of the other.

Competition can be exclusive or partial. Two mechanisms may both operate, yet

their relative explanatory importance can vary by domain or period. The central task is therefore to identify the overlap in explanandum and scope before deciding whether the theories genuinely compete.

Definition 21.670 (Explanatory overlap). *Explanatory overlap* is the portion of an explanandum, domain, scale, and time horizon for which two or more theories claim explanatory responsibility.

Proposition 21.671 (Competition-localization condition). *Competing explanations should be compared within their region of explanatory overlap rather than through global judgments about the theories as wholes.*

Localized comparison prevents a theory's strength in one domain from substituting for evidence about another. It also allows competition to become empirical. A mechanism may dominate under one institutional configuration while another becomes more important after a structural change.

Definition 21.672 (Discriminating evidence). *Discriminating evidence* is evidence whose expected interpretation differs materially across competing explanations after their concepts, scales, and background conditions have been aligned sufficiently for comparison.

Proposition 21.673 (Mechanism-discrimination condition). *Where competing theories predict similar outcomes through different mechanisms, explanatory comparison should seek evidence about mediating processes, counterfactual responses, timing, distributional signatures, or intervention effects that can discriminate among the mechanisms.*

Similar outcomes therefore do not establish equivalent explanation. Section 21.26 distinguished manifestational equivalence from deeper structural or behavioral equivalence. The same caution applies here: observational agreement can coexist with explanatory competition.

Proposition 21.674 (Coexistence-with-competition principle). *Evidence that several mechanisms coexist does not remove explanatory competition when the theories continue to disagree about mechanism weight, boundary conditions, causal ordering, or the conditions under which one mechanism transforms another.*

A multi-theoretical account can therefore retain competing explanations within one research programme. The task is to make the competition explicit and to state what further evidence would revise the relative explanatory weights.

21.28.3 Nested Explanations

Nested explanation arises when one theoretical account operates within conditions described by another. A behavioral mechanism can operate inside an institutionally specified choice architecture. A transaction-cost explanation can operate inside a historically specific property regime. A financial-instability mechanism can operate inside a broader political and regulatory order. A capability-conversion process can operate inside ecological and infrastructural constraints. The outer explanation establishes conditions under which the inner mechanism becomes possible, salient, or differently parameterized.

Definition 21.675 (Nested explanation). An explanation E_i is *nested* within an expla-

nation E_o when the objects, mechanisms, or parameters of E_i operate within boundary conditions or relational structures whose formation or persistence is explained by E_o .

The notation identifies a structural relation rather than an ontological hierarchy. The outer account can itself be nested within another explanation, and the inner account can retain substantial autonomy. Nested explanation is therefore compatible with methodological pluralism.

Definition 21.676 (Explanatory boundary condition). An *explanatory boundary condition* is a condition supplied by one explanatory account that materially defines the domain, parameters, admissible states, or transition possibilities of another account.

Proposition 21.677 (Nested-autonomy condition). *Nesting should not be interpreted as reduction unless the outer explanation can reconstruct the inner mechanism at the level of detail required by the explanandum without importing the inner theory's distinctive explanatory resources.*

An institutional account that explains why a market has particular rules does not thereby replace price theory within those rules. A political-economic account of property does not automatically replace an engineering model of production. Conversely, local mechanism models do not explain the formation of their own boundary conditions merely because those conditions appear as parameters.

Proposition 21.678 (Boundary-endogeneity condition). *When a theory treats as fixed a boundary condition that another theory explains as historically or relationally endogenous, multi-theoretical explanation should record both the local analytical usefulness of the fixed condition and the higher-order process through which that condition is generated or transformed.*

This condition is especially important for GRE. A relational-generative analysis often asks how the parameters of a local model came to exist and how present activity may alter them later. The question extends the explanation without invalidating a locally adequate model whose purpose requires temporary closure.

21.28.4 Scale-Specific Explanations

Scale-specific explanation concerns theories whose adequacy depends on the spatial, organizational, population, temporal, or network scale at which the phenomenon is examined. A mechanism visible at the transaction scale can disappear at the sectoral scale; a network relation can matter locally while macroeconomic stabilization dominates aggregate outcomes; ecological constraints can be negligible within a short project horizon while decisive over a longer material cycle. Scale therefore affects both what is observed and which explanatory relations remain stable.

Definition 21.679 (Explanatory scale). An *explanatory scale* is the spatial, organizational, population, network, temporal, or resolution range within which an explanatory contribution is claimed to retain adequate object definitions, mechanism relations, and evidential interpretation.

Definition 21.680 (Scale-specific adequacy). An explanation has *scale-specific adequacy* when its explanatory relations are sufficiently stable and informative within a stated scale range while their transfer beyond that range remains contingent on

additional conditions.

Scale-specific adequacy avoids two errors. The first is to dismiss a theory because it does not explain phenomena outside its intended scale. The second is to generalize a successful local explanation to larger or smaller scales without testing whether the objects and relations survive the change in resolution.

Proposition 21.681 (Scale-transfer condition). *An explanatory relation should be transferred across scales only when the aggregation, disaggregation, interaction, or invariance conditions required for that transfer are stated and sufficiently supported.*

Cross-scale transfer can fail through composition effects, emergent interactions, institutional mediation, changing network topology, or altered temporal feedback. The relevant failure is empirical and structural rather than a general prohibition on scale transfer.

Definition 21.682 (Cross-scale explanatory coupling). *Cross-scale explanatory coupling* is a specified relation through which a mechanism at one scale changes the state, parameters, constraints, or transition structure relevant to an explanation at another scale.

Proposition 21.683 (Scale-coupling condition). *A multi-scale explanation should identify the mechanisms of cross-scale coupling rather than infer causal influence solely from correlation among outcomes measured at different scales.*

The condition is particularly important where fast and slow processes interact. Short-horizon adjustments can accumulate into long-horizon institutional change; long-horizon infrastructures can constrain short-horizon choice; and shocks can propagate across network or organizational scales. Multi-theoretical explanation can assign different theories to these processes while keeping the coupling explicit.

21.28.5 Historical Layering

Historical layering addresses economic configurations in which mechanisms formed in different historical periods continue to coexist. A contemporary platform economy can combine long-standing property law, industrial labor institutions, financial conventions, digital network effects, algorithmic coordination, and recently constructed data-governance rules. A welfare regime can contain older household norms, later social-insurance institutions, contemporary activation policies, and emerging AI-mediated administrative processes. Theories developed for different historical objects can therefore remain simultaneously relevant when the corresponding relational layers persist.

Definition 21.684 (Historical explanatory layer). *A historical explanatory layer* is a set of mechanisms, institutions, categories, or relational structures generated under identifiable historical conditions that continues to exercise explanatory effects within a later configuration.

Layers need not be chronologically neat. Older institutions can be transformed by newer technologies; newer practices can depend on inherited legal categories; and periods of rapid change can create hybrid structures in which several generative logics coexist.

Definition 21.685 (Layered causal inheritance). *Layered causal inheritance* is the per-

sistence of historically generated structures or mechanisms that continue to shape later economic possibilities while being modified by subsequent layers.

Proposition 21.686 (Historical-layering condition). *A multi-theoretical historical explanation should distinguish mechanisms that persist from earlier configurations, mechanisms generated by later configurations, and interactions through which the later layers reproduce, redirect, or erode the earlier ones.*

This requirement prevents historical theories from being assigned to periods as if theories expired when their original contexts changed. The relevant question is whether the mechanism or relation remains materially instantiated.

Proposition 21.687 (Temporal-coexistence principle). *Theories associated with different historical problem settings can contribute simultaneously when the mechanisms they identify coexist within the present configuration under distinguishable scope conditions.*

Historical layering also guards against presentism. Contemporary categories can make older structures difficult to see even when those structures remain causal. Conversely, inherited theoretical categories can obscure genuinely new relations. Multi-theoretical explanation therefore requires a temporal audit of both the object and the concepts used to explain it.

Definition 21.688 (Historical-layer interaction). *A historical-layer interaction is a relation through which mechanisms generated in distinct historical layers alter one another's operation, persistence, interpretation, or generative consequences within a later configuration.*

Historical-layer interaction can be reinforcing, constraining, substitutive, or transformative. The analytical objective is to reconstruct the relation rather than to infer a single historical logic from coexistence.

21.28.6 Explanatory Pluralism

The preceding forms of combination support a disciplined explanatory pluralism. Pluralism is warranted when a phenomenon contains explanatory relations that cannot be represented adequately within one theoretical architecture at the required level of detail and scope. It is unwarranted when several theories merely restate the same mechanism, when incompatible commitments are silently averaged, or when theoretical diversity is treated as intrinsically superior to a simpler adequate explanation.

Definition 21.689 (Explanatory pluralism). *Explanatory pluralism is the disciplined use of multiple explanatory architectures when their differentiated contributions jointly improve the adequacy of an explanation relative to the stated question while their disagreements, redundancies, and scope limits remain explicit.*

This definition makes pluralism conditional on explanatory gain. The gain can consist of improved mechanism specification, broader domain coverage, better cross-scale reconstruction, stronger historical explanation, clearer normative localization, or identification of interactions that no single participating theory captures adequately.

Definition 21.690 (Explanatory architecture). *An explanatory architecture is the or-*

ganized set of analytical objects, mechanisms, levels, scales, historical layers, evidential warrants, and relations among them used to explain a specified phenomenon.

Proposition 21.691 (Pluralism-gain condition). *Adding a theory to a multi-theoretical explanation is warranted when its contribution changes the explanatory architecture materially by adding a distinct mechanism, boundary condition, scale relation, historical layer, evidential discriminator, or evaluative consequence relevant to the stated question.*

The condition excludes decorative pluralism. A contribution that merely renames an existing mechanism can still be pedagogically useful, but it does not strengthen the explanation unless the new language reveals a material distinction.

Definition 21.692 (Explanatory redundancy). *Explanatory redundancy occurs when two contributions perform substantially the same explanatory role over the stated domain without adding a material distinction in mechanism, scope, evidence, or implication.*

Redundancy is not always undesirable. Independent theories can converge on similar relations, thereby increasing confidence or offering alternative formalizations. The relevant point is to distinguish corroborative redundancy from additional explanatory coverage.

Proposition 21.693 (Minimal-plurality principle). *A multi-theoretical explanation should employ no more theoretical architectures than are needed to preserve the distinctions and mechanisms material to the explanandum at the stated level of adequacy.*

Minimal plurality combines parsimony with non-reduction. It does not demand a single theory; it demands that each retained theory earn its explanatory place.

Definition 21.694 (Plural explanatory map). *A plural explanatory map records each participating theory's assigned contribution, explanatory target, level, scale, historical layer, evidential warrant, interfaces with other contributions, region of competition or redundancy, and preserved theoretical remainder.*

The map extends the disagreement map of Section 21.27. The disagreement map records where theories cannot be merged. The plural explanatory map records how they can still cooperate in one explanation.

21.28.7 Criteria for Combination

Combination requires stronger discipline than coexistence. Theories can be individually useful and still form an incoherent joint explanation if their objects, causal directions, scales, or background conditions conflict. The criteria developed here therefore concern the compatibility of explanatory contributions, not the global compatibility of the theories from which they originate.

Definition 21.695 (Combination warrant). *A combination warrant is the stated justification for integrating two or more explanatory contributions within one explanatory architecture, including their distinct roles, interface relations, scope conditions, evidential support, and preserved disagreements.*

Proposition 21.696 (Object-compatibility condition). *Explanatory contributions can be combined only when the objects they connect can coexist within a sufficiently specified representation or when a translation relation between those objects is supplied*

without erasing a material distinction.

A representative-agent model and an internally differentiated household account, for example, cannot simply be placed side by side if both are asked to explain the same intra-household allocation mechanism. They can be combined if the representative unit is restricted to an aggregate task while internal relations are assigned to the differentiated account.

Proposition 21.697 (Causal-consistency condition). *Where combined theories assign causal relations among overlapping objects, the joint explanation should state whether those relations are compatible, sequential, reciprocal, competing, or condition-dependent.*

Contradictory causal arrows are not resolved by placing them in different paragraphs. They require adjudication, scope separation, or explicit preservation as competing explanations.

Proposition 21.698 (Scope-intersection condition). *A combination warrant should identify the intersection and differences among the participating theories' domain, scale, temporal, and institutional scope conditions.*

Proposition 21.699 (Evidential-coordination condition). *A multi-theoretical explanation should distinguish evidence that supports a shared empirical premise from evidence that supports one theory-specific mechanism, and it should avoid transferring warrant across theories merely because they address the same phenomenon.*

Evidential coordination matters because the same observation can play different roles in different theories. A price change can be an outcome, a signal, a manifestation of power, a coordination device, or evidence of scarcity depending on the explanatory architecture. Shared data do not automatically create shared inference.

Definition 21.700 (Combination matrix). *A combination matrix records, for each pair or set of explanatory contributions, object compatibility, causal relation, scope overlap, scale relation, temporal ordering, evidential relation, normative remainder, and the status of unresolved disagreement.*

Proposition 21.701 (Disagreement-preserving combination). *A combination is warranted only if the explanatory architecture can retain the constitutive disagreements identified by the disagreement preservation protocol whenever those disagreements remain material to interpretation or judgment.*

This proposition prevents combination from becoming covert synthesis. A welfare analysis and a capability analysis can contribute to one policy explanation while maintaining distinct evaluative criteria. A neoclassical price mechanism and a Marxian class analysis can coexist in a historical account without treating price and value categories as identical. An ecological constraint can bound a growth model without translating ecological significance into a single monetary metric.

Proposition 21.702 (Combination-revisability condition). *The architecture of a multi-theoretical explanation should remain revisable when new evidence changes the contribution, weight, boundary condition, or compatibility of one of its component explanations.*

Combination is therefore a research result rather than a permanent settlement. As theories and evidence change, explanatory roles can be reassigned.

21.28.8 Limits of Synthesis

Multi-theoretical explanation reaches its limit where combination would require eliminating distinctions that remain explanatory, evidential, historical, or normative. Synthesis is one possible result of dialogue, yet it is stronger than combination. A synthesis constructs a more unified explanatory architecture in which previously distinct contributions are integrated under common concepts or relations. Such integration is valuable when it preserves the explanatory gains of the source theories. It becomes misleading when unity is purchased through abstraction that removes the very disagreements or mechanisms that made the plurality informative.

Definition 21.703 (Theoretical synthesis). A *theoretical synthesis* is a reconstructed explanatory architecture that integrates contributions from previously distinct theories through a sufficiently common set of objects, relations, mechanisms, or evaluative coordinates while preserving the distinctions required for the stated explanatory purpose.

The definition makes synthesis purpose-relative. It does not require complete unification. A local synthesis can be warranted for a specific domain while broader disagreements remain.

Definition 21.704 (Synthesis loss). *Synthesis loss* is the explanatory, semantic, historical, evidential, or normative content that becomes unavailable when distinct theoretical contributions are integrated into a more unified architecture.

Synthesis loss resembles translation loss but occurs at a later stage. Translation can already be lossy; synthesis adds the risk that translated concepts become absorbed into a common vocabulary and their source-specific functions disappear.

Proposition 21.705 (Synthesis-warrant condition). A *theoretical synthesis* is warranted only when the explanatory gains from integration exceed the material synthesis losses for the stated purpose and when those losses are explicitly recorded.

Definition 21.706 (Synthesis boundary). A *synthesis boundary* is the point at which further integration would require suppressing a constitutive disagreement, collapsing a scale or historical distinction, conflating incompatible value grammars, or treating a theory-specific mechanism as interchangeable with a broader relational description.

Proposition 21.707 (Synthesis-stopping condition). *Theoretical integration should stop at the synthesis boundary and retain a multi-theoretical architecture when additional unification would reduce explanatory adequacy or erase a material theoretical remainder.*

This stopping condition is especially important for GRE. Its relational vocabulary is broad enough to host many translated concepts, yet hosting them does not establish that they should be absorbed into GRE's own categories. Care can enter a relational architecture while retaining its embodied and normative specificity. Capabilities can interact with generative capacity while remaining a distinct evaluative space. Marxian value can be related to heterogeneous value without being converted into it. Ecological limits can constrain generative trajectories without becoming generic constraints detached from biophysical mechanisms.

Definition 21.708 (Explanatory federation). An *explanatory federation* is a multi-

theoretical architecture in which theories retain identifiable conceptual and methodological autonomy while their contributions are coordinated through explicitly specified interfaces for a shared explanatory task.

An explanatory federation provides a useful model where synthesis reaches its boundary. The participating theories need not share one ontology, one value grammar, or one method. They require enough translation and interface specification to cooperate on the shared problem.

Proposition 21.709 (Federated-explanation principle). *When material theoretical remainders persist, a federated explanation is preferable to deeper synthesis if it preserves greater explanatory adequacy, clearer evidential accountability, and more explicit disagreement.*

Definition 21.710 (Multi-theoretical explanation protocol). *A multi-theoretical explanation protocol records the explanandum, participating theories, assigned contributions, levels and scales, historical layers, explanatory interfaces, regions of competition and redundancy, evidential warrants, disagreement-preservation requirements, combination warrants, synthesis losses, and revision conditions of a joint explanation.*

Proposition 21.711 (Plural-explanation accountability principle). *A multi-theoretical explanation is stronger when a reader can identify which theory supports each explanatory step, how the steps are connected, which claims remain contested, and what evidence could revise the architecture.*

The protocol completes the movement from translation to coordinated explanation. Sections 21.25–21.27 specified what can be translated, what can be treated as equivalent, and what should remain in disagreement. The present section adds the conditions under which these differentiated theoretical contributions can explain one phenomenon together. The result is neither unrestricted eclecticism nor compulsory synthesis. It is a structured explanatory ecology in which complementary levels, competing mechanisms, nested boundary conditions, scale-specific processes, and historical layers can be coordinated while preserving their warranted distinctions.

The next section changes the direction of dialogue. Rather than asking how GRE can organize or coordinate other economic theories, Section 21.29 asks what GRE itself should learn from them. Multi-theoretical explanation supplies the immediate discipline for that inquiry: existing economics can correct GRE precisely where another theory provides a stronger mechanism, measurement strategy, historical account, normative distinction, institutional analysis, or domain-specific explanation.

21.29 GRE Revision through Economic-Theoretical Dialogue

Sections 21.12–21.28 reconstructed major economic traditions, developed translation and equivalence disciplines, preserved irreducible disagreement, and specified conditions for multi-theoretical explanation. The role of the present section is reflexive: it turns those comparative results back onto GRE itself. Its objective is to identify where established economic traditions possess domain-specific strengths that should constrain, refine, or correct GRE's concepts, methods, empirical practices, and disciplinary boundaries. The discussion proceeds through domain-specific strengths, mechanism specification, measurement and empirical operationalization, historical reconstruction, normative differentiation, institutional analysis, conceptual correction, and boundary revision. The method is comparative and self-revising. GRE is treated as an open research programme whose relational-generative vocabulary acquires credibility through disciplined exposure to stronger local explanations rather than through its ability to redescribe them in a common language.

The comparative programme therefore imposes obligations on GRE. A broad framework can be useful because it connects objects that specialized theories isolate, yet breadth can also obscure mechanism, measurement, historical specificity, normative distinction, or institutional detail. Existing economics provides accumulated techniques for narrowing those risks. Neoclassical analysis can discipline local choice and equilibrium arguments; Marxian political economy can sharpen historically specific accounts of class, accumulation, and exploitation; Keynesian and post-Keynesian analysis can clarify effective demand, money, uncertainty, and financial instability; institutional, behavioral, evolutionary, feminist, capability, ecological, commons, sociological, and digital-economy traditions each provide further specialized objects and methods developed in Sections 21.13–21.24. GRE should therefore learn through selective correction rather than assimilation.

Definition 21.712 (Disciplinary learning relation). A *disciplinary learning relation* is a relation in which a theory or research programme revises its concepts, methods, evidential standards, scope conditions, or boundaries because another body of inquiry provides a more adequate account of a specified problem within an identified domain.

Proposition 21.713 (Reflexive-dialogue principle). *Theoretical dialogue strengthens GRE only when the translation of other theories can generate revisions of GRE itself rather than functioning solely as a means of redescribing external theories in GRE vocabulary.*

This principle changes the direction of comparison. Sections 21.25–21.28 asked how theories can be translated, compared, preserved in disagreement, and coordinated. The present section asks what follows when another theory remains locally stronger after those operations. The answer is not automatic incorporation. It can be a restriction of GRE's claim, adoption of a method, refinement of a concept, addition of a missing variable or relation, revision of a formal representation, or recognition that the relevant problem belongs partly outside economics. Table 21.29 summarizes the principal forms of revision developed in the section.

Table 21.29: Principal forms of GRE revision through economic-theoretical dialogue

Revision domain	External contribution	GRE revision task	Main failure risk
Domain adequacy	Specialized explanatory success within bounded problems	State local scope and preserve specialized objects	Framework universalization
Mechanisms	More precise causal or generative pathways	Replace broad relational description with testable mechanism where warranted	Mechanism-free relational vocabulary
Measurement	Validated indicators, designs, and identification strategies	Connect relational constructs to observable evidence and uncertainty	Unfalsifiable abstraction
Historical reconstruction	Periodized categories and historically generated institutions	Index concepts and mechanisms to historical conditions	Historical flattening
Normative differentiation	Distinct evaluative criteria and moral objects	Separate descriptive generativity from normative judgment	Normative absorption
Institutional analysis	Rules, rights, governance, enforcement, and organizational detail	Specify institutional interfaces and implementation conditions	Institutional underspecification
Conceptual correction	Sharper concepts, distinctions, and counterexamples	Revise GRE definitions, formalism, and inferential scope	Vocabulary preservation at the expense of adequacy
Boundary revision	Evidence of domain resistance or disciplinary remainder	Reassign questions across GRE and adjacent fields	Disciplinary expansion without limit

21.29.1 Domain-Specific Strengths

A general framework should begin its learning by recognizing local superiority. The comparative sections of this chapter show that economic traditions are often strongest where their objects, methods, and historical purposes have been developed together over long periods. Neoclassical choice theory can be highly informative where preferences, constraints, and institutional rules are sufficiently stable for the problem under examination. Keynesian analysis can be more direct where aggregate demand, monetary conditions, expectations, and macroeconomic coordination dominate the explanandum. Institutional analysis can be more precise where rules, rights, governance, enforcement, and organizational forms constitute the central causal architecture. Feminist and care economics can reveal relations of dependency, unpaid labor, embodiment, and social reproduction that disappear under household aggregation. Ecological economics can establish biophysical constraints that a purely relational-economic vocabulary cannot infer on its own.

Definition 21.714 (Domain-specific strength). A *domain-specific strength* is a theory's comparatively well-developed capacity to identify, explain, measure, or evaluate a

specified class of phenomena under stated scope conditions.

The definition is comparative without requiring an overall ranking of theories. One theory can be stronger for price formation, another for care relations, another for financial fragility, and another for ecological throughput. Section 21.28 already established that these contributions can coexist within a multi-theoretical explanation. GRE should treat such local strengths as constraints on its own abstraction.

Definition 21.715 (Local theoretical deference). *Local theoretical deference* is the practice of allowing a domain-specialized theory to set the primary conceptual or methodological terms of inquiry where its explanatory adequacy is stronger for the specified problem and where GRE has not independently established a superior account.

Local deference does not make GRE redundant. GRE can still connect the specialized explanation to wider relational, temporal, generative, power, or value consequences. Its role changes from replacement to articulation. For example, a locally adequate model of market response can be embedded within a GRE account of how the market institution was generated and how its outcomes alter later capabilities. The local mechanism remains owned by the specialized theory unless GRE reconstructs it with equivalent or greater precision.

Proposition 21.716 (Domain-adequacy discipline). *GRE should claim explanatory priority only within domains for which its relational-generative reconstruction provides additional explanatory content, stronger evidential support, or clearer inferential control than the specialized theory it seeks to extend.*

This discipline protects the open programme from becoming a universal vocabulary whose apparent breadth substitutes for local explanatory work. It also converts comparison into a map of dependence: GRE can specify which parts of its analyses rely on price theory, institutional economics, political economy, behavioral evidence, ecological science, capability evaluation, or other specialized traditions.

Definition 21.717 (Borrowed explanatory module). *A borrowed explanatory module* is a concept, mechanism, measurement strategy, or model taken from another theory and retained with its original scope conditions and evidential requirements inside a wider GRE explanation.

Proposition 21.718 (Module-provenance condition). *When GRE uses a borrowed explanatory module, the source theory, preserved assumptions, modified assumptions, and added relational-generative interpretation should remain distinguishable.*

The condition prevents theoretical borrowing from becoming silent appropriation. It also preserves the possibility that evidence later supports the module while challenging the surrounding GRE interpretation, or supports the GRE extension while requiring revision of the imported model.

21.29.2 Mechanism Specification

Relational language can identify dependencies without yet explaining how a change propagates through them. Existing economics repeatedly demonstrates the importance of mechanism specification. Search frictions, marginal substitution, contractual incentives, balance-sheet feedback, habit formation, selection, bargaining, net-

work effects, care dependence, institutional enforcement, and ecological throughput describe different pathways even when each can be represented as a relation. GRE therefore gains explanatory precision when it distinguishes the existence of a relation from the mechanism by which that relation produces an outcome.

Definition 21.719 (Mechanism specification). *Mechanism specification* identifies the entities or configurations involved in a transformation, the state conditions under which it operates, the mediating process, the expected temporal sequence, and the observable or reconstructable consequences through which the proposed process can be evaluated.

Definition 21.720 (Relational-mechanism gap). A *relational-mechanism gap* exists when an analysis establishes that two or more configurations are related but does not specify the process through which the relation generates the claimed economic effect.

The gap is especially likely in broad statements about power, generativity, trust, institutions, or value. Saying that an ownership relation affects future opportunity is analytically useful, yet the claim becomes stronger when the pathway is specified: access can be restricted, investment altered, information withheld, bargaining positions changed, or legal authority exercised. Different mechanisms can produce similar manifestations and can respond differently to intervention.

Proposition 21.721 (Mechanism-priority condition). *Where a specialized economic theory provides a mechanism that explains the local transformation with greater specificity than a general GRE relation, the mechanism should be retained and the GRE relation should be treated as a higher-order context unless additional evidence warrants a different reconstruction.*

Mechanism priority is compatible with relational extension. GRE can ask how the mechanism itself was generated, what other relations condition it, and how its operation changes later possibilities. The extension should add explanatory layers rather than replace a precise process with a broader label.

Definition 21.722 (Mechanism-interface map). A *mechanism-interface map* records how a locally specified mechanism connects to wider GRE objects, including the relations that enable it, the constraints that bound it, the value consequences it mediates, and the future configurations it helps generate.

Proposition 21.723 (Mechanism-interface accountability). *A GRE extension of an established mechanism should identify which parts of the explanation are inherited, which interfaces are newly introduced, and which generative consequences remain hypotheses requiring separate support.*

This requirement is particularly important when GRE uses formal tools. A network, operator, field, transition kernel, or dynamic system can represent a mechanism only when its variables and transformations correspond to a substantively specified process. Formal sophistication cannot substitute for mechanism identification.

21.29.3 Measurement and Empirical Operationalization

GRE's broad objects create a demanding measurement problem. Relations, generative capacity, conversion interfaces, power, epistemic access, institutional stabil-

ity, heterogeneous value, and future possibility are rarely observed directly. Existing economics offers a large repertoire of empirical strategies for constructing observable indicators, identifying variation, designing experiments, defining samples, evaluating measurement error, and separating descriptive association from stronger causal claims. The lesson for GRE is procedural: every empirical use of a relational-generative concept requires an explicit evidential interface.

Definition 21.724 (Empirical operationalization). *Empirical operationalization* is the construction of a documented relation between a theoretical object and the observations, measurements, classifications, interventions, or records used to investigate it.

Operationalization does not collapse theory into measurement. Chapter 4's manifestation architecture already distinguishes relational reality from its observable manifestations. The present chapter adds a comparative discipline: other economic traditions can reveal where GRE's manifestations are too indirect, too aggregated, too endogenous to the process being studied, or too weakly connected to the concept claimed.

Definition 21.725 (Evidential interface). An *evidential interface* is the specified mapping between a theoretical claim and the empirical traces through which that claim can be supported, challenged, compared, or revised.

Behavioral and experimental economics, discussed in Section 21.17, is especially instructive because it makes design conditions part of the evidential object. Institutional and historical economics, Section 21.16, demonstrates the value of records and sequence-sensitive evidence. Capability and human-development approaches, Section 21.20, show how measurement can remain plural when the evaluative object cannot be reduced to income. Ecological economics, Section 21.21, further demonstrates that some economic claims require physical indicators whose evidential basis lies partly outside economics.

Proposition 21.726 (Operationalization-traceability condition). *An empirical GRE claim should permit a reader to trace how observations become indicators, how indicators relate to theoretical objects, which transformations or classifications intervene, and where uncertainty enters the inference.*

Definition 21.727 (Measurement remainder). A *measurement remainder* is the theoretically relevant content that the selected empirical indicators do not capture or distinguish within the stated observation regime.

Measurement remainders should be documented rather than hidden by a scalar index. A measure of network position can omit relation quality; a monetary value can omit care or ecological significance; an administrative category can omit informal participation; an observed choice can omit unavailable alternatives. These omissions do not invalidate measurement. They delimit its meaning.

Proposition 21.728 (Measurement-plurality condition). *Where a GRE object has materially heterogeneous manifestations, empirical adequacy may require several indicators whose disagreements are analyzed rather than compressed into a single metric by default.*

The resulting empirical programme should also inherit established identification discipline. Claims about relational causation, institutional effects, or generative consequences should distinguish descriptive reconstruction, mechanism evidence, inter-

vention evidence, and counterfactual inference. GRE's epistemic humility becomes operational when claim strength follows the design and evidence actually available.

21.29.4 Historical Reconstruction

Many GRE categories are intended to be history-bearing, yet historical sensitivity is stronger when it is reconstructed rather than asserted. Classical political economy, Marxian analysis, institutional economics, evolutionary economics, feminist political economy, and economic sociology each demonstrate different ways in which economic objects emerge within historical sequences. The lesson is that history should enter GRE through periodization, category formation, institutional succession, path dependence, archival evidence, and changing causal relations rather than through generic references to historical context.

Definition 21.729 (Historical reconstruction). *Historical reconstruction* is the evidence-guided account of how an economic object, relation, category, institution, mechanism, or configuration emerged, stabilized, transformed, and acquired its later causal or interpretive significance.

Definition 21.730 (Historical indexation). *Historical indexation* specifies the period, institutional configuration, material conditions, and category regime within which an economic concept or mechanism is claimed to be adequate.

Historical indexation constrains formal generalization. A concept such as labor market, household, firm, platform, property, or money can persist across periods while the relations constituting it change. GRE should therefore avoid treating a stable label as evidence of stable relational structure.

Proposition 21.731 (Historical-category discipline). *A GRE category should be treated as historically portable only when the identity criteria required for comparison remain sufficiently stable across the periods being connected.*

Section 21.14 is instructive because Marxian categories derive part of their explanatory meaning from historically specific relations of production. Section 21.16 adds institutional path dependence, while Section 21.18 adds evolutionary routines and sequence-sensitive adaptation. GRE can connect these insights through generative spacetime, but the temporal formalism should not erase the historical content that gives the mechanisms their meaning.

Definition 21.732 (Historical mechanism inheritance). *Historical mechanism inheritance* occurs when a present economic mechanism depends on institutions, categories, infrastructures, rights, expectations, or relational patterns generated in earlier periods.

Proposition 21.733 (Inheritance-reconstruction condition). *Where present relational structure depends on historical inheritance, GRE should reconstruct the relevant sequence and persistence mechanism rather than representing the inherited condition as an unexplained initial state.*

Historical learning therefore changes the role of initial conditions in GRE models. Some conditions can be analytically fixed for a local problem, but a broader generative explanation should remain able to ask how they were produced and why they persisted. The answer may require methods and evidence developed more fully in

history, sociology, law, political economy, or institutional research than in GRE itself.

21.29.5 Normative Differentiation

GRE's vocabulary of generativity, preservation, capability, relation, value, and future possibility creates strong normative temptations. The comparative dialogue shows why those temptations require restraint. Capability approaches distinguish resources, functionings, capabilities, agency, and freedom. Feminist and care traditions distinguish recognition, dependency, care, social reproduction, and distribution. Ecological economics distinguishes biophysical feasibility from evaluative choice. Marxian analysis distinguishes exploitation and class relations from broader inequality. These distinctions show that an increase in generative capacity cannot by itself determine whether an outcome is just, legitimate, desirable, sustainable, or worthy of preservation.

Definition 21.734 (Normative differentiation). *Normative differentiation* is the practice of separating distinct evaluative objects and criteria before relating them, including welfare, capability, freedom, equality, recognition, care, justice, legitimacy, sustainability, and generative consequence.

Proposition 21.735 (Generativity-normativity separation). *A finding that an arrangement expands, preserves, or redirects future possibility does not by itself establish the normative desirability of that arrangement or of the possibilities generated.*

This proposition is a central correction to possible overextensions of GRE. Generativity is an analytical property of transformation. Normative judgment requires additional criteria concerning who gains possibilities, who bears costs, what kinds of relations are created, whether participation is legitimate, how non-human and future affected parties are considered, and whether the underlying conversions are acceptable.

Definition 21.736 (Normative interface). A *normative interface* specifies how a descriptive or explanatory GRE result is connected to an independently stated evaluative criterion without treating the criterion as derivable from the descriptive result alone.

Proposition 21.737 (Criterion-provenance condition). *When GRE makes a normative judgment, the evaluative criterion and its theoretical or ethical provenance should be stated separately from the relational-generative facts to which it is applied.*

Normative differentiation also limits aggregation. A policy can improve one capability while damaging another, increase aggregate output while worsening recognition, preserve an institution while entrenching domination, or create future technical possibilities while degrading ecological conditions. GRE's heterogeneous-value architecture can represent these tensions, yet representation does not settle them.

Definition 21.738 (Normative remainder). A *normative remainder* is evaluatively material content that survives relational translation because the relevant judgment depends on criteria not exhausted by GRE's descriptive or generative categories.

Proposition 21.739 (Normative-remainder preservation). *GRE should preserve normative remainders explicitly when translation into relational, capability, value, or generative language would weaken the source criterion or obscure a disagreement about*

what ought to matter.

This principle carries forward Section 21.27. The purpose of dialogue is not to translate every normative theory into one GRE metric. It is to make the interfaces among distinct judgments more inspectable.

21.29.6 Institutional Analysis

Institutional specificity is another area where existing economics should discipline GRE. Relational descriptions can identify governance relations, yet economic outcomes depend on the concrete architecture of rights, rules, enforcement, membership, exit, authority, accounting, liability, information, and dispute resolution. Institutional economics, commons scholarship, cooperative economics, political economy, feminist economics, and platform analysis each show that these details can alter who can act, how value is converted, which risks are transferred, and which future trajectories remain feasible.

Definition 21.740 (Institutional specification). *Institutional specification* identifies the rules, rights, roles, decision procedures, enforcement mechanisms, jurisdictional boundaries, resource claims, and accountability relations through which an economic arrangement becomes operational.

Definition 21.741 (Institutional interface). An *institutional interface* is a rule-governed point at which subjects or organizations acquire, exercise, transfer, contest, or lose access, authority, resources, recognition, or obligations.

Institutional interfaces give substantive content to many GRE conversion interfaces. A conversion from data to revenue, labor to income, membership to voting authority, ownership to control, or public eligibility to service access is mediated by rules that can be documented. The relational-generative analysis becomes stronger when these rules are explicit.

Proposition 21.742 (Institutional-detail condition). *Where an economic effect depends on institutional rules, a GRE explanation should identify the operative rule architecture before attributing the effect to a more general relational property.*

Section 21.22 is especially instructive because commons and cooperative arrangements cannot be understood through a generic category of collective ownership. Membership, monitoring, rights, governance, reciprocity, and distribution differ across arrangements. Section 21.24 similarly shows that platform control depends on concrete interfaces, standards, data rights, algorithms, and contractual relations.

Definition 21.743 (Institutional implementation gap). An *institutional implementation gap* exists when a proposed relational or normative arrangement lacks a specified rule architecture capable of producing, maintaining, or enforcing the relations required by the proposal.

Proposition 21.744 (Implementation-adequacy principle). *Applied GRE should distinguish desirable relational configurations from institutionally feasible arrangements and should treat the design of rules, incentives, authority, monitoring, and revision procedures as independent analytical tasks.*

This distinction is important for policy and organizational design. A generatively attractive future state may be unreachable through the available institutions, or an in-

stitution designed to reach it may generate unintended power relations. Institutional analysis therefore constrains both feasibility and consequence.

21.29.7 Conceptual Correction of GRE

The strongest form of disciplinary learning occurs when dialogue changes GRE's own concepts. Comparative analysis can reveal that a GRE term is too broad, conflates distinct mechanisms, duplicates an established concept, or obscures a source tradition's sharper distinction. Conceptual correction should therefore be treated as a normal result of the research programme rather than as evidence of theoretical failure.

Definition 21.745 (Conceptual correction). A *conceptual correction* is a revision to a GRE definition, distinction, relation, formal representation, or inferential rule prompted by evidence that the existing formulation is ambiguous, overbroad, under-specified, misleadingly novel, or inconsistent with stronger domain knowledge.

Several correction types follow from the preceding comparative sections. GRE should keep generative value distinct from established generative-value traditions and state its narrower contribution in heterogeneous conversion, circulation, capture, return, dissipation, and regeneration. Generative capacity should remain distinct from capability-theoretic freedom and agency. Criticality should remain distinct from generic crisis, instability, nonlinearity, or rapid change. Relational power should not absorb exploitation, authority, domination, bargaining power, or institutional control into one undifferentiated category. Manifestational equivalence should not become ontological or normative identity.

Definition 21.746 (Conceptual collision). A *conceptual collision* occurs when a GRE term and an established disciplinary term use similar language while carrying materially different identity criteria, mechanisms, evidential implications, or normative meanings.

Proposition 21.747 (Collision-resolution condition). *Where conceptual collision occurs, GRE should clarify the distinction, narrow its term, adopt established terminology, or state an explicit translation relation rather than relying on lexical similarity.*

Definition 21.748 (Conceptual redundancy). *Conceptual redundancy* exists when a GRE concept adds no material distinction, explanatory role, or inferential capacity beyond an established concept under the same domain and scope conditions.

Proposition 21.749 (Redundancy-revision principle). *A GRE concept that is substantively redundant should be removed, narrowed, or explicitly treated as a translation label unless retaining it serves a demonstrable cross-domain or formal function.*

Conceptual correction also concerns formalism. If an operator, graph, field, category, or dynamical representation imports assumptions that the substantive theory does not support, the representation should be revised or abandoned. The book's ontological suspension makes such correction easier: formal structures are methodological resources rather than metaphysical commitments.

Definition 21.750 (Revision trigger). A *revision trigger* is evidence, counterexample, competing explanation, measurement failure, historical finding, conceptual collision, or formal inconsistency that materially reduces the adequacy of a current GRE formulation.

Proposition 21.751 (Revision-responsiveness condition). *An open GRE research programme should record revision triggers and modify its claims when maintaining the existing formulation would require ignoring stronger evidence or a more precise disciplinary distinction.*

The principle gives operational meaning to epistemic humility. Revisability is not a general statement that future research may change the theory. It is a procedure for identifying when change has become warranted.

21.29.8 Boundary Revision of GRE

Dialogue finally revises the boundaries of GRE. The framework interfaces with political theory, law, sociology, history, ecology, education, aesthetics, computer science, and broader GR foundations. These interfaces are productive because economic processes participate in wider relational systems. They also create a risk that GRE expands until every relation with an economic consequence becomes part of economics. Existing disciplines provide a counterweight: some questions should remain primarily theirs even when GRE has reasons to connect to them.

Definition 21.752 (Disciplinary boundary). A *disciplinary boundary* is a revisable division of explanatory, methodological, evidential, or normative responsibility that identifies which problems a research programme treats as internal, which it addresses through explicit interfaces, and which it leaves primarily to adjacent fields.

Definition 21.753 (Boundary revision). *Boundary revision* is the reassignment of a problem, concept, method, or claim between GRE's internal programme and its interfaces with adjacent disciplines when accumulated inquiry shows that the previous assignment is inadequate.

Boundary revision can move in both directions. A topic initially treated as external can become economically central when it changes allocation, production, value conversion, institutional access, or future capability. Conversely, a topic initially analyzed inside GRE can require transfer to another field when its principal questions are juridical, ecological, ethical, educational, aesthetic, technical, or otherwise governed by evidence and standards GRE does not possess.

Proposition 21.754 (Interface-before-expansion principle). *When a problem materially intersects GRE but is governed by specialized concepts or evidential standards from another field, GRE should prefer an explicit interdisciplinary interface before expanding its own domain to absorb the problem.*

Definition 21.755 (Domain overextension). *Domain overextension* occurs when GRE claims explanatory or evaluative authority over a problem mainly because the problem can be represented relationally, even though the decisive mechanisms, evidence, or normative standards belong to another domain.

Proposition 21.756 (Boundary-evidence condition). *Expansion of GRE's domain should be supported by a demonstrated economic explanatory task, an identifiable contribution beyond existing disciplinary accounts, and an interface plan for preserving the concepts and evidence of neighboring fields.*

This condition applies equally to the broader GR framework. Relational representation is highly portable, yet portability does not establish disciplinary ownership. An

ecological relation can be economically consequential while remaining scientifically grounded in ecology. A legal status can structure economic access while retaining juridical meaning. A moral claim can constrain institutional design without becoming an economic preference. GRE's boundary should therefore follow explanatory responsibility rather than representational reach.

Definition 21.757 (GRE revision ledger). A *GRE revision ledger* is a structured record of domain-specific strengths learned from other theories, adopted mechanisms and methods, measurement requirements, historical and normative corrections, institutional specifications, conceptual revisions, unresolved disagreements, and resulting boundary changes.

Proposition 21.758 (Cumulative-self-revision principle). *GRE's theoretical development should be evaluated partly by whether successive dialogue produces traceable corrections and sharper boundaries rather than only by whether the framework can accommodate an expanding range of phenomena.*

The revision ledger completes the reflexive task of this section. Existing economics contributes to GRE through more than source material or cases for relational translation. It supplies locally stronger mechanisms, mature empirical practices, historically grounded categories, normative distinctions, and institutional detail capable of changing GRE's own architecture. The resulting research programme becomes narrower in some places and more precise in others. Such revision is compatible with the book's broader aim because generative relational analysis is presented as an open programme rather than a closed replacement theory.

The next section examines the complementary risk on the translation side. Even after GRE has accepted correction from existing economics, GR itself can remain too powerful as a common language. Section 21.30 therefore identifies the limits of GR as a translation language and the conditions under which relational translation should stop.

21.30 Limits of GR as a Translation Language

Sections 21.25–21.29 developed a translation discipline, differentiated several equivalence relations, preserved irreducible disagreement, constructed multi-theoretical explanations, and required theoretical dialogue to revise GRE itself. The role of the present section is to test the common language used throughout that sequence. Its objective is to identify conditions under which GR's relational vocabulary ceases to clarify a source theory and begins to distort, assimilate, or overextend it. The discussion proceeds through relational overtranslation, loss of theoretical specificity, unwarranted equivalence, hidden normative assumptions, historical flattening, formal overreach, domain-specific resistance, and translation stopping conditions. The method is reflexive and diagnostic. GR is treated as one possible translation language whose adequacy varies by object, theory, domain, scale, historical setting, and inferential purpose.

The issue arises precisely because GR is portable. Objects from heterogeneous traditions can often be described through entities, relations, constraints, capacities, structures, processes, histories, manifestations, value conversions, and generative consequences. That portability can create genuine comparative insight. It can also create the appearance that a successful relational redescription has captured the source theory's constitutive content. The distinction between representational reach and translational adequacy is therefore central to the remainder of Chapter 21.

Definition 21.759 (Translation-language adequacy). *Translation-language adequacy* is the degree to which a target language can represent the source theory's analytically material distinctions, mechanisms, historical conditions, evidential commitments, normative criteria, and inferential consequences for a stated comparative purpose.

Proposition 21.760 (Translation-language limitation principle). *A translation language should be treated as locally inadequate when its use reduces the analyst's ability to preserve or test a distinction that is material to the source theory or to the problem under examination.*

The proposition changes the standard of success. Adequacy requires more than assigning each source concept a GR term; the resulting representation should retain enough source-specific structure to support the intended inference. Table 21.30 summarizes the principal limit classes developed in this section.

21.30.1 Relational Overtranslation

GR begins from relations, histories, constraints, differences, structures, and processes because these coordinates can reveal economic formations that appear static when represented only through isolated objects. The same coordinates become problematic when relational description is allowed to substitute for the source concept itself. A class relation, care relation, legal relation, ecological dependency, capability relation, network tie, contractual relation, and exchange relation can each be represented relationally while remaining analytically different kinds of relation.

Definition 21.761 (Relational overtranslation). *Relational overtranslation* occurs when a source-theoretical object is translated into sufficiently general GR language

Table 21.30: Principal limits of GR as a translation language

Limit class	GR translation risk	Diagnostic question	Appropriate response
Relational overtranslation	Distinct concepts collapse into generic relational language	Does the relational description preserve the source theory's identity criteria and mechanism?	Restore distinctions or keep the source vocabulary primary
Specificity loss	Historical, institutional, semantic, or methodological content becomes inaccessible	Which source-theoretical inferences disappear after translation?	Record the loss and restrict the translation claim
Unwarranted equivalence	Shared relational form is treated as substitutability	Which equivalence signature is actually supported?	Return to scoped correspondence or non-equivalent translation
Normative leakage	Evaluative criteria enter GR categories without explicit provenance	Which judgments are descriptive, evaluative, or theory-specific?	State normative interfaces and preserve remainders
Historical flattening	Historically generated categories appear transhistorical	Which conditions generated and sustained the source category?	Re-index concepts and mechanisms to historical conditions
Formal overreach	Mathematical representation adds unsupported structure	Which formal assumptions are empirically or theoretically warranted?	Weaken, revise, or remove the formal representation
Domain resistance	Specialized objects exceed GR's disciplinary or evidential competence	Which field supplies the decisive concepts and evidence?	Use an interdisciplinary interface and retain local authority
Stopping condition	Additional translation would increase distortion more than intelligibility	What material distinction would further mapping erase?	Stop translation and record the unresolved remainder

that its distinguishing mechanism, identity criterion, historical formation, evidential status, or normative significance becomes materially less visible.

Relational overtranslation is therefore different from ordinary abstraction. Abstraction is often necessary for comparison. Overtranslation occurs when the abstraction removes precisely the feature that gives the source theory explanatory force. Describing exploitation as an asymmetric relation, for example, can support comparison with other power relations, yet exploitation in Marxian analysis carries specific relations among labor power, surplus production, appropriation, and historically constituted production relations. A generic asymmetry representation cannot substitute for that structure. Similar caution applies to care, capability, ecological regeneration, fiduciary obligation, or legal authority.

Proposition 21.762 (Relational-sufficiency condition). *A relational translation is sufficient for a stated task only when the relations retained in the target language preserve*

the source distinctions required for the relevant explanation, comparison, or evaluation.

Definition 21.763 (Relational compression). *Relational compression* is the reduction of several source-theoretical distinctions into a smaller set of GR relational coordinates for a specified comparative purpose.

Relational compression can be useful. A comparison of coordination systems may temporarily encode market exchange, hierarchical command, commons governance, and platform ranking through relations among access, authority, information, and allocation. The compression becomes unsafe when a later argument relies on distinctions that the compressed representation discarded.

Proposition 21.764 (Differentiation-preservation condition). *Where several source concepts map to the same GR coordinate, subsequent inference should preserve a record of their source distinctions unless the analysis establishes that those distinctions are immaterial to the question at hand.*

This condition places a practical limit on GR's apparent universality. A common language is valuable partly because it compresses. Its value declines when compression becomes irreversible and analysts can no longer reconstruct which theoretical distinctions entered the common representation.

21.30.2 Loss of Theoretical Specificity

A second limit concerns theoretical specificity. Economic theories are structured configurations whose concepts acquire meaning through their internal architecture. Their central categories derive meaning from relations among propositions, methods, evidential standards, historical problems, research communities, and normative commitments. Translation into GR can preserve selected relations while weakening this architecture.

Definition 21.765 (Theoretical specificity). *Theoretical specificity* is the set of distinctions, inferential relations, mechanisms, methods, historical conditions, and evaluative commitments that gives a theory its identifiable explanatory architecture within a stated domain.

Definition 21.766 (Specificity loss). *Specificity loss* is the reduction in source-theoretical content that occurs when translation preserves a shared comparative structure while making one or more constitutive source distinctions unavailable for later inference.

Specificity loss can occur even when individual translated statements remain accurate. A Keynesian description of liquidity preference, uncertainty, and investment can be rendered through expectations, constraints, and temporal relations, yet the macroeconomic architecture linking money, effective demand, and investment can weaken if those concepts are translated independently. An institutional rule can become a generic constraint, obscuring the fact that its authority, enforceability, and jurisdiction are institutional rather than merely relational properties. A capability can become an opportunity relation, losing its evaluative connection to substantive freedom.

Proposition 21.767 (Source-architecture preservation). *Cross-theoretical translation*

should preserve enough of the source theory's internal architecture to reconstruct why its concepts have the inferential roles attributed to them.

Definition 21.768 (Source-theory provenance). *Source-theory provenance* is the explicit record linking a translated concept, mechanism, criterion, or empirical claim to the theoretical architecture from which its meaning and warrant are derived.

Proposition 21.769 (Provenance-preservation condition). *A GRE reconstruction should preserve source-theory provenance when the translated element would otherwise appear to originate from GR or to carry a broader domain of validity than the source theory supports.*

Provenance also protects intellectual priority. Relational language is old and widespread across economics, sociology, institutional analysis, feminist theory, capability approaches, ecological thought, and political economy. GRE's contribution depends on how it reorganizes and extends certain problems while preserving the prior relational insights of other traditions. Source-theory provenance therefore supports both conceptual accuracy and responsible attribution.

21.30.3 Unwarranted Equivalence

Translation can also create equivalence too easily. Section 21.26 introduced equivalence signatures precisely because two theories can preserve the same relation, function, manifestation, or role while differing elsewhere. GR can increase the risk of overclaim because heterogeneous theories often become structurally similar after they are projected into a sufficiently abstract relational representation.

Definition 21.770 (Unwarranted equivalence). An *unwarranted equivalence* is a claim of substitutability, sameness of explanatory role, or structural correspondence that exceeds the preservation relation established by the available translation and evidence.

A market price and an administrative score can both mediate allocation. A household and a firm can both be represented as organized relational configurations. A care relation and a service transaction can both transfer time and capability. A legal right and a platform permission can both alter access. These similarities can be analytically useful. They do not establish that the paired objects share the same mechanism, institutional standing, history, normative meaning, or causal consequences.

Proposition 21.771 (Equivalence-evidence condition). *A GR translation should support an equivalence claim only at the dimensions explicitly preserved by the relevant equivalence signature and independently warranted by the comparison.*

Definition 21.772 (Translation-induced similarity). *Translation-induced similarity* is apparent correspondence whose strength derives partly from the coarseness or shared structure of the target language and therefore exceeds the correspondence independently demonstrated among the source theories.

Translation-induced similarity is especially likely when the target vocabulary uses highly general objects such as relation, constraint, capacity, state, process, or trajectory. Almost any economic theory can be expressed through some combination of those terms. The translation therefore establishes representability before it establishes theoretical correspondence.

Proposition 21.773 (Similarity-audit condition). *Where a strong theoretical correspondence appears only after projection into a more general GR representation, the analyst should test whether the correspondence survives reconstruction in the source theories' own vocabularies.*

The audit can reduce a proposed equivalence to a weaker translation relation, reveal a genuine local equivalence, or preserve the theories as non-equivalent descriptions of overlapping phenomena. Each outcome is compatible with productive theoretical dialogue.

21.30.4 Hidden Normative Assumptions

GR's generative vocabulary can make evaluative commitments appear descriptive. Terms such as capability, sustainability, resilience, participation, recognition, generativity, relational quality, or future possibility often carry positive associations in ordinary discourse. Their analytical use does not by itself establish that the represented outcome is desirable. Section 21.29 therefore separated descriptive generativity from normative judgment. The same separation is required within translation.

Definition 21.774 (Normative import). *A normative import is an evaluative criterion, priority, or presumption introduced into a translation from either the source theory, the target language, or the analyst's framing.*

Definition 21.775 (Evaluative leakage). *Evaluative leakage occurs when a normative import affects the translated description or comparison without being identified as an independent evaluative commitment.*

Evaluative leakage can operate in several directions. A capability-oriented source theory may bring a substantive concern with freedom into a GR representation. A care-ethical source may bring duties of attentiveness and responsiveness. Ecological economics may bring judgments about sustainability or intergenerational responsibility. Conversely, a GRE emphasis on preserving future generative capacity may privilege option creation over other goods unless the criterion is explicitly separated from description.

Proposition 21.776 (Normative-separation condition). *A cross-theoretical GR translation should identify the provenance of evaluative criteria and distinguish descriptive relational claims from judgments that depend on those criteria.*

Proposition 21.777 (Criterion-transparency condition). *When alternative normative criteria would rank the same translated configuration differently, the translation should preserve that evaluative plurality and keep the competing criteria explicit outside the common relational vocabulary.*

This condition is especially important for heterogeneous value. GRE can represent partially incommensurable value forms and conversion interfaces, but representation does not determine how conflicts among them ought to be resolved. A translation language that silently turns values into comparable relational consequences would reproduce the commensuration problem it is designed to expose.

21.30.5 Historical Flattening

GR's abstract coordinates can travel across historical periods, which is useful for comparison and dangerous for explanation. Theories often contain categories whose meaning depends on historically specific institutions, technologies, legal forms, production relations, or social struggles. A relational translation can preserve the abstract relation while detaching it from the conditions under which the category became economically operative.

Definition 21.778 (Historical flattening). *Historical flattening* is the loss of historically constitutive conditions when a theory-specific category or mechanism is translated into a more portable representation and subsequently treated as if its identity and operation were stable across periods.

The risk can arise with capital, wage labor, household, market, firm, property, data, platform, care, institution, or even economy. A relational representation can identify ownership, exchange, authority, or dependency across many periods, while the concrete meaning of those relations changes with legal status, technical infrastructure, organizational form, and political order.

Definition 21.779 (Historical index). A *historical index* records the temporal, institutional, technological, legal, and social conditions under which a translated concept or mechanism has the identity and explanatory role attributed to it.

Proposition 21.780 (Historical-index condition). *Where a source concept is historically constituted, its GR translation should retain a historical index sufficient to prevent the translated category from acquiring an unsupported transhistorical scope.*

Definition 21.781 (Genealogical remainder). A *genealogical remainder* is source-theoretical content concerning the emergence, contestation, transformation, or institutional stabilization of a category that is not preserved by its synchronic relational representation.

Proposition 21.782 (Genealogy-preservation condition). *A relational comparison should preserve genealogical remainders whenever historical formation materially affects the meaning, mechanism, or scope of the translated object.*

Historical flattening also affects GRE's own concepts. Generative capacity, value conversion, relational power, and epistemic mediation can vary across historical configurations. Their abstraction is useful only if the framework remains able to explain how the relevant relations are instituted differently in different periods.

21.30.6 Formal Overreach

A further limit arises when GR's formal resources outrun the source theory or the evidence. Graphs, operator algebras, fields, dynamical systems, category-theoretic diagrams, event structures, and spacetime representations can clarify relational architecture. Their use also imports mathematical structure. Adjacency, continuity, composition, state spaces, transition rules, metrics, topology, or algebraic closure can become assumptions about the economic object even when the source material establishes only a qualitative relation.

Definition 21.783 (Formal overreach). *Formal overreach* occurs when a mathemati-

cal representation used for translation introduces structural assumptions, precision, comparability, or inferential consequences that exceed the theoretical or empirical warrant available for the source object.

Definition 21.784 (Representation excess). *Representation excess* is the set of formal properties possessed by a chosen representation that are not independently established as properties of the economic phenomenon being represented.

Representation excess is unavoidable in many models. The relevant question is whether the excess affects inference. A network model may encode binary edges because the data require them while the underlying relation is graded and multiplex. A field representation may assume local continuity where institutional change is discontinuous. An operator formalism may define composition rules for analytical convenience while the empirical transformations are only partially composable.

Proposition 21.785 (Formal-warrant condition). *A formal GR translation should distinguish properties required by the representation from properties independently supported for the source phenomenon, especially when the distinction affects substantive inference.*

Definition 21.786 (Formal retreat). *Formal retreat* is the deliberate replacement of a stronger formal representation with a weaker structural, qualitative, or partially specified representation when the stronger assumptions lack sufficient warrant.

Proposition 21.787 (Formal-retreat condition). *When representation excess materially determines a conclusion, GRE should weaken or abandon the formalism unless independent theory or evidence supports the additional structure.*

Formal retreat is compatible with rigor. It can increase rigor by making uncertainty and underdetermination explicit. Ontological suspension further supports this practice because mathematical usefulness need not be defended through claims about the ultimate ontology of economic reality.

21.30.7 Domain-Specific Resistance

Some objects resist GR translation because the decisive standards of adequacy belong to a specialized domain. Ecological processes depend on biophysical evidence. Legal relations depend on doctrine, jurisdiction, institutional authority, and interpretive practice. Educational processes depend on developmental, pedagogical, and institutional knowledge. Technical systems depend on engineering constraints and implementation detail. Ethical claims depend on normative argument. GR can connect these objects to economic relations without becoming the primary language in which their validity is established.

Definition 21.788 (Domain-specific resistance). *Domain-specific resistance* is the persistence of analytically decisive distinctions, mechanisms, evidential standards, or validity conditions that a general GR translation cannot replace without relying on the specialized domain from which those standards originate.

Domain-specific resistance can be strong even when relational translation is easy. A legal entitlement can be represented as a relation of authority and access, yet whether the entitlement exists can turn on statutory text, precedent, jurisdiction, or procedural status. An ecological threshold can constrain a generative trajectory,

yet its location requires ecological measurement and modeling. A machine-learning system can mediate economic allocation, yet its technical behavior can depend on model architecture, data processing, and evaluation procedures that economic relational analysis alone cannot determine.

Proposition 21.789 (Domain-resistance condition). *Where a translated claim depends on specialized validity conditions, GRE should retain the relevant domain's concepts, methods, and evidential authority at the interface while using the GR representation for the economic or relational consequences it can support.*

Definition 21.790 (Domain-autonomy remainder). *A domain-autonomy remainder is content whose validity continues to depend on a specialized discipline even after its economic or relational consequences have been translated into GR.*

Proposition 21.791 (Interface-preference condition). *When domain-autonomy remainders are material, interdisciplinary interface construction is preferable to absorbing the source domain into GR's own vocabulary.*

This proposition extends the boundary revision discipline of Section 21.29. GRE can ask how ecological, juridical, technical, or educational structures alter economic access and future possibilities while leaving the underlying domain-specific claims under the standards of the appropriate field.

21.30.8 Translation Stopping Conditions

The preceding limits imply a positive stopping discipline. Section 21.25 defined a general translation stopping condition: mapping should stop where further translation would erase a material distinction. The present subsection specifies how that principle applies when GR is the target language. Stopping is warranted when additional relationalization would increase apparent unity while reducing theoretical specificity, evidential accountability, historical adequacy, normative transparency, or domain competence.

Definition 21.792 (GR cessation warrant). *A GR cessation warrant is a documented reason to suspend further translation into GR because the next mapping step would produce material overtranslation, specificity loss, unwarranted equivalence, normative leakage, historical flattening, formal overreach, or domain-authority displacement.*

Proposition 21.793 (Stop-before-assimilation principle). *GR translation should stop before the common language requires a source theory to surrender a constitutive distinction that remains relevant to explanation, evidence, evaluation, or disciplinary responsibility.*

Stopping does not terminate dialogue. It changes the form of dialogue. Theories can remain connected through explicit interfaces, partial translations, disagreement maps, and multi-theoretical explanation while retaining concepts that have no adequate GR substitute.

Definition 21.794 (Non-translation record). *A non-translation record documents a source concept, relation, mechanism, criterion, or domain claim that remains intentionally untranslated, the reason translation was suspended, the comparisons still permitted, and the evidence that could justify reopening the translation later.*

Proposition 21.795 (Re-entry condition). *A suspended translation may be reopened when new conceptual distinctions, empirical evidence, formal tools, or domain knowledge reduce the previously identified loss without erasing the source-theoretical remainder.*

This re-entry condition keeps stopping revisable. It avoids turning present limits into permanent barriers. A richer target vocabulary may later preserve a distinction that GR currently compresses, or new evidence may establish a formal correspondence that was previously only analogical.

Definition 21.796 (Translation-language limit profile). *A translation-language limit profile records, for a source theory or domain, the GR mappings that are adequate, the dimensions requiring source-language retention, the identified losses, the relevant cessation warrants, and the conditions for possible re-entry.*

Proposition 21.797 (Meta-linguistic humility principle). *The quality of the distinctions GR preserves and the limits it records should be primary criteria for evaluating it as a translation language; breadth of relational redescription is a secondary criterion.*

The limit profile completes the metatheoretical sequence of Sections 21.25–21.30. Translation creates common coordinates; equivalence states scoped preservation relations; disagreement records constitutive differences; multi-theoretical explanation coordinates differentiated contributions; reflexive dialogue revises GRE; and the present section establishes that GR itself remains subject to translation failure. The resulting architecture is therefore intentionally incomplete. Some theoretical content can be translated, some can be coordinated without equivalence, and some should remain in its source language until a stronger interface becomes available.

This limitation is productive for the next stage of the book. A research programme should emerge from the questions, contradictions, empirical gaps, formal gaps, normative gaps, and domain tests that survive theoretical dialogue. Section 21.31 therefore turns from the completed translation audit to the research problems generated by that audit.

21.31 GRE Research-Programme Formation

Sections 21.12–?? reconstructed major economic traditions, tested translation across heterogeneous theoretical architectures, distinguished several forms of equivalence, preserved irreducible disagreement, developed multi-theoretical explanation, required dialogue to revise GRE, and identified limits of GR itself as a translation language. The role of the present section is to convert the results of that dialogue into a disciplined agenda for further inquiry. Its objective is to specify how newly revealed questions, contradictions, empirical gaps, formal gaps, normative gaps, domain-specific tests, and revision requirements can become organized components of a GRE research programme. The discussion proceeds through those seven sources of programme formation and closes with a research-programme architecture. The method is synthetic and prospective while remaining diagnostic: the section does not settle the questions generated by dialogue; it identifies how they should be retained, differentiated, tested, and revised.

The preceding dialogue changes the meaning of a research programme. A programme cannot be defined only by topics GRE already knows how to describe. The comparative exercise has generated problems that arise precisely where GRE encounters concepts, mechanisms, evidential standards, normative criteria, historical formations, and domain-specific objects that resist easy incorporation. These encounters should become research objects rather than editorial inconveniences. The programme therefore includes both questions that extend GRE and questions that may constrain, fragment, or contract its claims.

Definition 21.798 (Research-programme formation). *Research-programme formation* is the organized conversion of unresolved theoretical, empirical, formal, historical, normative, and domain-specific problems into revisable research questions, test designs, model-development tasks, comparative inquiries, and framework-revision procedures.

Definition 21.799 (Dialogue-generated research object). A *dialogue-generated research object* is a problem, distinction, mechanism, remainder, contradiction, or uncertainty that becomes analytically visible through comparison among GRE and other theoretical traditions.

Proposition 21.800 (Dialogue-to-programme condition). *A result of theoretical dialogue warrants entry into the GRE research programme when it identifies a material uncertainty or disagreement that can be stated with sufficient precision to guide evidence, formalization, interpretation, domain testing, or framework revision.*

This condition prevents Chapter 21 from ending as a catalogue of similarities and differences. Translation has programme value when it changes the questions that later inquiry can ask. Table 21.31 summarizes the principal pathways developed below.

21.31.1 Questions Revealed by Translation

Translation is productive partly because it exposes questions that remain hidden inside a single theoretical vocabulary. A theory can appear internally complete while leaving unasked how its categories correspond to differently constructed objects,

Table 21.31: Principal pathways of GRE research-programme formation

Programme pathway	Diagnostic object	Research output	Possible GRE consequence
Translation-generated questions	Unresolved distinctions exposed by mapping	Discriminating questions and comparative designs	New problem classes or narrower claims
Dialogical contradictions	Incompatible mechanisms or commitments	Contradiction maps and adjudication tasks	Mechanism revision or preserved disagreement
Empirical gaps	Missing observations, measures, or identification	Data strategies and evidential interfaces	Operationalization or empirical contraction
Formal gaps	Missing or excessive representational structure	Model tasks and formal-comparison tests	New formalism, weakened formalism, or formal retreat
Normative gaps	Unspecified evaluative criteria or affected parties	Normative-interface studies and contestation procedures	Criterion separation or revised governance claims
Domain-specific tests	Claims exposed to specialized disciplinary objects	Transfer tests and stress cases	Bounded generalization or domain deference
GRE revision	Dialogue-supported framework deficiency	Versioned revision records	Conceptual correction, extension, or contraction
Programme architecture	Relations among unresolved research tasks	Research streams, interfaces, and portfolios	Open and revisable programme development

scales, histories, or value regimes. Sections 21.25 and 21.26 showed that translation and equivalence require explicit preservation criteria. Once those criteria are stated, the failure of a mapping can itself reveal a research question.

Definition 21.801 (Translation-generated question). A *translation-generated question* is a research question produced by an identified mismatch, remainder, ambiguity, or scope difference between source and target theoretical representations.

A translation-generated question differs from a generic literature gap. Its origin can be traced to a specific mapping attempt. Translating capability into a relational-generative vocabulary, for example, raises questions about whether future option creation should be treated as part of capability analysis, as a separate GRE extension, or as an interface between two evaluative architectures. Translating ecological metabolism into economic value language raises a different question: which material constraints can be represented through value relations and which require independently measured biophysical conditions. The research problem emerges from the mismatch rather than from an assumption that one vocabulary should absorb the other.

Proposition 21.802 (Question-provenance condition). A *translation-generated question* should retain a record of the source concepts, target concepts, mapping attempt,

and material remainder that produced it.

Provenance matters because later reformulation can otherwise erase the reason a question was difficult. A broad question such as how institutions affect generativity can obscure whether the original difficulty concerned property rights, informal norms, enforcement, membership, care obligations, ecological limits, or platform control. Preserving the translation path maintains the discriminating structure of the problem.

Definition 21.803 (Discriminating research question). A *discriminating research question* is one whose possible answers would differentiate among competing theoretical mechanisms, scope claims, representations, or evaluative interpretations.

Proposition 21.804 (Comparative-leverage condition). *Where theoretical dialogue produces several plausible accounts of the same phenomenon, programme priority increases when a question can generate evidence or analysis that distinguishes among those accounts rather than merely restating their shared vocabulary.*

This principle gives Chapter 21 a problem-forming role. Questions about power, value conversion, path dependence, care, uncertainty, platform intermediation, ecological capacity, or institutional reproduction should be designed so that different traditions can make meaningfully different contributions. The research programme then becomes partly a programme of constructing better questions: questions whose formulation preserves theoretical plurality while permitting some claims to become more precise, more limited, or more strongly supported.

Definition 21.805 (Question family). A *question family* is a set of related research questions generated by a common unresolved interface among theories, methods, scales, domains, or normative criteria.

Question families can organize research more effectively than isolated hypotheses. A value-conversion family, for example, could include empirical questions about conversion institutions, historical questions about the emergence of commensuration regimes, normative questions about legitimate conversion, formal questions about partial comparability, and domain questions about care, ecology, or data. The family preserves a common research object while allowing different methods and disciplines to enter through explicit interfaces.

21.31.2 Contradictions Revealed by Dialogue

Theoretical dialogue also reveals contradictions. Some contradictions arise between theories; others arise within GRE when concepts imported from different traditions are placed into the same architecture. Section 21.27 distinguished irreducible disagreement from failed translation. The present subsection treats contradiction as a source of programme formation: a contradiction should be localized, typed, and converted into a research task before any attempt at resolution.

Definition 21.806 (Dialogical contradiction). A *dialogical contradiction* is an incompatibility among claims, mechanisms, classifications, normative criteria, or scope conditions that becomes visible when two or more theoretical architectures are compared within a common analytical problem.

Definition 21.807 (Contradiction profile). A *contradiction profile* records the location,

type, scale, historical scope, evidential basis, normative content, and current resolvability of a dialogical contradiction.

Contradictions can occur at several levels. A mechanism contradiction concerns incompatible causal accounts. A category contradiction concerns different identity criteria for an economic object. An evidential contradiction concerns different judgments about what observations warrant a claim. A normative contradiction concerns incompatible evaluative priorities. A scope contradiction arises when two claims appear incompatible only because they apply to different populations, periods, scales, or institutional conditions.

Proposition 21.808 (Contradiction-localization condition). *Before a contradiction is treated as a framework-level conflict, the analysis should test whether it can be localized to mechanism, category, evidence, normative criterion, scale, historical scope, or representation.*

Localization avoids premature synthesis and premature rejection. A neoclassical choice model and an institutional account of preference formation may conflict if both claim complete explanatory authority over the same process. They can also become complementary when one models choice inside a locally stable preference structure and the other explains how that structure is generated. The relevant research task is therefore to identify the conditions under which the two accounts compete and the conditions under which they occupy different explanatory layers.

Proposition 21.809 (Contradiction-productivity condition). *A dialogical contradiction becomes research-productive when it can be converted into an observation, comparison, historical reconstruction, formal test, or normative argument capable of changing the standing of at least one participating claim.*

Definition 21.810 (Framework-internal contradiction). *A framework-internal contradiction is an incompatibility among GRE commitments that becomes visible when concepts or mechanisms derived from different sources are jointly applied.*

Such contradictions deserve particular attention because they reveal where GRE has accumulated vocabulary faster than it has established integration. A framework can simultaneously emphasize open future formation, historical path dependence, formal tractability, ontological suspension, heterogeneous value, and normative pluralism. These commitments can coexist, but specific models may place them under tension. Research should record those tensions rather than resolving them through implicit hierarchy.

Proposition 21.811 (Internal-contradiction priority). *Where theoretical dialogue reveals an internal contradiction in GRE, programme priority should be given to clarifying the contradiction before GRE is extended further through the affected concepts or mechanisms.*

21.31.3 Empirical Gaps

GRE has developed a rich vocabulary for relational structures, heterogeneous value, power, generativity, historical trajectories, and future possibility. Dialogue with empirical economics, experimental economics, institutional research, ecological economics, capability studies, economic sociology, and domain-specific inquiry shows

that conceptual richness creates a demanding empirical burden. Programme formation therefore requires identifying which GRE objects can currently be observed, which can be approximated, which remain latent, and which may be too weakly specified for empirical use.

Definition 21.812 (Empirical gap). An *empirical gap* is a material disconnection between a theoretical claim and the observations, measurements, identification strategies, comparative cases, or interpretive evidence required to evaluate that claim within its stated scope.

Definition 21.813 (Observability gap). An *observability gap* occurs when a theoretically relevant object or relation lacks an adequate observational interface for the research purpose under consideration.

Generative capacity illustrates the problem. It may be manifested through later option creation, capability expansion, network formation, institutional durability, knowledge production, ecological regeneration, or other consequences. A single indicator is unlikely to capture these heterogeneous manifestations across domains. The empirical programme should therefore begin by specifying what manifestation is expected, over what horizon, at what scale, and through which observation regime.

Proposition 21.814 (Empirical-interface condition). *A GRE claim enters an empirical research stream only when the theoretical object, observation regime, indicator or interpretive evidence, temporal window, and inferential limitation can be stated with sufficient precision for independent scrutiny.*

Definition 21.815 (Identification gap). An *identification gap* is the remaining uncertainty about whether an observed pattern can be attributed to the proposed relational or generative mechanism rather than to alternative mechanisms compatible with the available evidence.

An identification gap differs from an observability gap. A relation can be well measured while its causal role remains uncertain. Network position, institutional membership, prices, policy exposure, or platform ranking can be observed with substantial precision while the mechanism connecting them to future capability or value conversion remains underidentified.

Proposition 21.816 (Evidence-design priority). *Where a central GRE mechanism is empirically underidentified, programme development should prioritize designs that distinguish plausible mechanisms over accumulation of additional descriptive indicators alone.*

Definition 21.817 (Empirical research ledger). An *empirical research ledger* records a GRE claim, its observable manifestations, available data or interpretive sources, identification requirements, measurement remainders, relevant alternative explanations, and current evidential status.

This ledger makes empirical openness concrete. Some claims may remain conceptual or heuristic because suitable evidence is unavailable. Others may become operational in particular domains before they become portable elsewhere. A research programme can accommodate both states if their evidential standing is explicit.

21.31.4 Formal Gaps

The dialogue also exposes formal gaps. GRE uses networks, dynamical systems, fields, operators, partial orders, category-theoretic constructions, history-bearing structures, and other mathematical resources selectively. Existing economic traditions show both the analytical power of formal discipline and the risks of imposing mathematical structure whose assumptions exceed the empirical or conceptual problem. A formal programme should therefore identify where formal representation is missing, where existing representation is insufficient, and where formal retreat is preferable.

Definition 21.818 (Formal gap). A *formal gap* is a mismatch between an analytically material theoretical relation and the formal representation currently available to express, derive, compare, or test that relation.

Definition 21.819 (Representational gap). A *representational gap* occurs when an existing formal model omits a distinction, dependency, temporal relation, scale coupling, or value structure required by the substantive problem.

Formal gaps should be diagnosed locally. A model of relational allocation may need higher-order relations. A model of historical generativity may need event order, path dependence, or changing state spaces. A model of heterogeneous value may require partial comparison or typed conversion rather than a single scalar objective. A model of institutional change may require endogenous rule modification. These needs do not imply that one mathematical architecture should contain them all.

Proposition 21.820 (Formalization-priority condition). *A formal gap warrants model development when additional formal structure is expected to clarify a mechanism, generate a discriminating implication, expose an inconsistency, improve empirical linkage, or make a scope condition explicit.*

Definition 21.821 (Formal comparison task). A *formal comparison task* examines whether two representations preserve the same analytically relevant structures, behaviors, observables, or intervention consequences under an explicit equivalence signature.

Formal comparison connects Section 21.26 to the research programme. Several representations may be useful for the same economic object without being interchangeable. A network representation can preserve connectivity while a field representation captures distributed influence; an agent-based model can reproduce emergent patterns while an operator representation highlights transformation structure. The programme should ask what each representation preserves and what it suppresses.

Proposition 21.822 (Formal-plurality condition). *Where several formal representations preserve different material features of the same problem, GRE should retain representational plurality unless a stronger equivalence claim has been established for the intended inference.*

Definition 21.823 (Formal-retreat task). A *formal-retreat task* identifies mathematical assumptions whose removal would improve correspondence with the substantive problem or restore distinctions obscured by the current representation.

Formal programme development therefore includes subtraction. Removing an

unnecessary metric, equilibrium condition, scalarization, Markov assumption, fixed topology, or ontological interpretation can be a substantive advance when the removed structure was carrying unsupported implications.

21.31.5 Normative Gaps

Normative gaps are equally important. GRE can describe heterogeneous values, conversion interfaces, power, capability change, participation, preservation, and future possibility. Those descriptions frequently create normative questions without settling them. Dialogue with capability, feminist, ecological, Marxian, commons, welfare, and care traditions makes visible several criteria that can conflict even when the descriptive analysis is shared.

Definition 21.824 (Normative gap). A *normative gap* is an unresolved evaluative question that remains after the relevant descriptive, causal, relational, or generative properties have been specified.

Definition 21.825 (Criterion gap). A *criterion gap* occurs when an analysis requires an evaluative judgment but has not specified the criterion, ordering principle, procedural standard, or source of normative authority by which that judgment is to be made.

A system can generate more future options while distributing them unequally. It can preserve a community while limiting exit. It can improve aggregate capability while degrading ecological conditions. It can produce efficient coordination through surveillance or concentrated control. These cases cannot be settled by a generativity metric alone.

Proposition 21.826 (Normative-research separation). A *GRE research question that contains an evaluative conclusion should separate the empirical or relational claim from the normative criterion required to reach that conclusion.*

Definition 21.827 (Affected-party gap). An *affected-party gap* occurs when the set of subjects, communities, future persons, non-human beings, or ecological systems materially affected by an economic arrangement has not been adequately represented in the evaluative frame.

Affected-party gaps connect normative inquiry to power and epistemics. Some affected parties have limited voice, weak legal standing, low observability, or no direct participation in present decision processes. Normative research therefore includes questions about representation, proxy judgment, intergenerational responsibility, non-human affectedness, and the legitimacy of conversion among heterogeneous values.

Proposition 21.828 (Normative-interface research condition). *Where several normative criteria remain plausible, GRE should treat their interface, conflict, and decision procedure as research objects rather than silently selecting one criterion through model design.*

Definition 21.829 (Normative research ledger). A *normative research ledger* records the evaluative criteria invoked in a GRE inquiry, their provenance, affected parties, unresolved conflicts, conversion assumptions, procedural requirements, and remaining normative remainders.

This ledger maintains the distinction established in Section 21.29: generativity can inform normative judgment while remaining analytically separate from the grounds of that judgment.

21.31.6 Domain-Specific Tests

Theories often appear stronger in abstract comparison than in domain application. Chapter 19 showed that education, labor, finance, urban systems, ecological systems, platforms, communities, institutions, and other domains impose different mechanisms and evidential constraints. Theoretical dialogue therefore generates a programme of domain-specific tests: cases chosen because they expose GRE concepts to objects, scales, institutions, and evidence that the framework cannot define by itself.

Definition 21.830 (Domain-specific test). A *domain-specific test* is an inquiry that evaluates a GRE concept, mechanism, or scope claim within a domain whose specialized objects, evidence, institutions, and causal processes provide independent constraints on the analysis.

Definition 21.831 (Domain transfer test). A *domain transfer test* examines whether a GRE claim developed in one domain retains its meaning, mechanism, and evidential support when applied to another domain.

Transfer should not be presumed from shared relational vocabulary. Trust in finance, care, science, commons governance, and platform participation can each involve expectations and relations while depending on different institutional supports and failure modes. Similarity at one descriptive level may coexist with substantial domain remainder.

Proposition 21.832 (Bounded-generalization condition). A *GRE mechanism should be generalized across domains only to the extent that the mechanism's required conditions and relevant outcome relations survive domain translation with identifiable evidence.*

Definition 21.833 (Stress domain). A *stress domain* is a domain selected because its objects, constraints, temporalities, affected parties, or evidential practices are expected to challenge a GRE claim more strongly than the domain in which that claim was initially developed.

Stress domains are especially valuable for open programmes. A relational account developed in digital markets can be tested in care or ecology, where monetization, agency, temporality, and affectedness differ sharply. A generativity concept developed in education can be tested in finance, where option creation can coexist with fragility or unequal exposure. The purpose is not to demonstrate portability by default; it is to discover where portability fails and why.

Proposition 21.834 (External-correction condition). *When a domain-specific discipline identifies a material mechanism or constraint absent from a GRE account, the research programme should revise the GRE claim or establish an explicit domain interface before extending the claim further.*

Definition 21.835 (Domain-test portfolio). A *domain-test portfolio* is a deliberately varied set of empirical or interpretive cases used to evaluate the robustness, scope, and failure modes of a GRE concept across contrasting domains.

A portfolio should include cases with different scales, institutions, data conditions,

value regimes, and temporal structures. This approach makes domain diversity an epistemic resource rather than a collection of illustrations.

21.31.7 Revision of GRE

The research programme becomes genuinely open when questions, contradictions, evidence, formal results, normative inquiry, and domain tests can alter GRE itself. Section 21.29 introduced theoretical deference, conceptual correction, boundary revision, and a GRE revision ledger. The present subsection places those elements into a recurrent programme cycle.

Definition 21.836 (GRE revision cycle). A *GRE revision cycle* is a documented sequence in which a framework claim is exposed to theoretical dialogue or inquiry, receives evidence or criticism, is reassessed against its scope and assumptions, and is retained, modified, differentiated, suspended, or withdrawn.

Proposition 21.837 (Revision-trigger condition). A *GRE claim should enter a revision cycle when new evidence, theoretical contradiction, domain failure, formal inconsistency, normative remainder, or translation-language limitation materially changes the support for its present formulation.*

Definition 21.838 (Revision class). A *revision class* identifies the principal form of framework change: clarification, differentiation, extension, mechanism replacement, empirical re-anchoring, formal retreat, domain contraction, interface creation, or claim withdrawal.

Revision classes make change legible. A failed domain transfer need not imply rejection of the original concept; it may justify contraction of scope. An empirical failure can indicate a measurement problem, an incorrect mechanism, or an over-generalized claim. A normative challenge may require criterion separation rather than conceptual abandonment. The class should follow the diagnosed defect.

Proposition 21.839 (Versioned-revision condition). *Material revisions to GRE should preserve the prior claim, the reason for revision, the evidence or argument supporting the change, and the scope of the revised claim so that framework development remains historically inspectable.*

Definition 21.840 (Framework debt). *Framework debt* is the accumulation of unresolved conceptual, empirical, formal, normative, or domain-specific problems that are repeatedly bypassed while dependent claims continue to expand.

Framework debt is analogous to a research liability. It does not require immediate resolution of every open question, but it should remain visible. A programme that continues to build on unstable distinctions can generate apparent theoretical breadth while increasing later revision costs.

Proposition 21.841 (Framework-debt condition). *Where several later claims depend on the same unresolved framework problem, programme priority should increase for that problem because its resolution has consequences across multiple research streams.*

Proposition 21.842 (Contraction legitimacy). *A well-supported contraction of GRE's domain, mechanism claim, or formal scope constitutes legitimate programme progress when it increases correspondence between claim strength and available support.*

This proposition is important for a generative research programme. Openness con-

cerns the possibility of revision, including revision toward smaller claims. A framework can become stronger by learning where it should remain silent, where another discipline should lead, or where a prior generalization should become a local hypothesis.

21.31.8 Research-Programme Architecture

The final task is architectural. The questions generated in this chapter are heterogeneous: some concern theory reconstruction, others empirical identification, formal modeling, historical explanation, normative evaluation, domain transfer, or framework revision. A GRE research programme therefore requires relations among research streams rather than a single sequence of problems.

Definition 21.843 (GRE research-programme architecture). The *GRE research-programme architecture* is the organized set of research streams, interfaces, revision procedures, evidence regimes, domain tests, and open-problem records through which GRE develops while preserving theoretical plurality, epistemic humility, and disciplinary boundaries.

Definition 21.844 (Research stream). A *research stream* is a sustained family of related questions sharing a principal analytical object, method interface, domain, or revision problem while remaining connected to the wider programme through explicit dependencies.

Possible streams include relational economic architecture, heterogeneous value and conversion, generativity and future option formation, power and asymmetry, historical-relational dynamics, epistemic economy, AI capability asymmetry, ecological relations, institutional formation, empirical operationalization, formal representation, and normative interfaces. Chapter 22 can specify these streams in greater detail. The present chapter establishes how they should arise from dialogue rather than from a closed list of GRE topics.

Proposition 21.845 (Research-stream interface condition). *Where two research streams depend on a shared concept or mechanism, the programme should specify the interface and revision dependency rather than allowing each stream to stabilize incompatible local meanings unnoticed.*

Definition 21.846 (Programme dependency). A *programme dependency* records that the standing of one research claim or stream materially depends on the resolution, specification, or evidential status of another programme object.

Dependencies make framework debt and revision propagation visible. A revised account of generative capacity may affect value, policy, education, AI, and sustainability research simultaneously. A new account of power may alter institutional and platform analyses. A change in the epistemic-event architecture may affect empirical reconstruction across several domains. Programme architecture should therefore support propagation of revisions rather than allowing local updates to remain isolated.

Definition 21.847 (Research portfolio). A *research portfolio* is a set of concurrent research streams selected to maintain productive variation across theoretical, empirical, formal, historical, normative, and domain-specific inquiry.

Proposition 21.848 (Portfolio-balance condition). *A GRE research portfolio should avoid persistent dependence on one mode of inquiry when unresolved programme objects require evidence, interpretation, formalization, or normative analysis that the dominant mode cannot supply.*

Portfolio balance does not require equal effort across methods. It requires that the programme retain access to the modes of inquiry needed to correct its own blind spots. A heavily formal programme can accumulate empirical and historical debt; a primarily interpretive programme can leave mechanism discrimination unresolved; a domain-rich programme can fragment conceptually if shared objects are not compared; a theoretically elegant programme can remain normatively opaque if evaluative criteria are left implicit.

Definition 21.849 (Open programme state). *An open programme state is a versioned representation of GRE's current established claims, provisional hypotheses, active contradictions, empirical and formal gaps, normative remainders, domain-test results, revision dependencies, and unresolved research questions.*

Proposition 21.850 (Open-programme continuity). *GRE remains an open research programme when its current architecture preserves both the claims it can presently support and the unresolved objects capable of revising those claims.*

Theoretical dialogue therefore closes Chapter 21 by producing a programme architecture rather than a final synthesis. Existing economics remains a continuing source of concepts, mechanisms, methods, evidence, criticism, and domain knowledge. GR remains a revisable translation language rather than a universal meta-language. GRE remains an economic research programme whose development can include extension, differentiation, empirical strengthening, formal refinement, historical reconstruction, normative clarification, domain contraction, and theoretical deference. Chapter 22 takes this architecture as its starting point and develops the substantive research programme in explicit research streams.

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