Chapter 3

Constitution and Research Programme of Generative Relational Economics

Chapter 3 completes the foundational movement of Part I by turning historical emergence and intellectual possibility into disciplinary constitution. Chapter 1 examined the historical conditions under which an economic framework centered on relations, generation, changing capacities, and future conditions of possibility becomes increasingly relevant. Chapter 2 reconstructed the philosophical, economic, social-theoretical, normative, scientific, and formal lineages from which such a framework can draw without treating their differences as reducible to a single doctrine. The present chapter asks a different question: what kind of research programme follows when those historical problems and theoretical resources are organized specifically around economic inquiry? Its task is therefore constitutive. It specifies the provisional identity, objects, scales, questions, epistemic commitments, modes of inquiry, normative interfaces, and boundaries of Generative Relational Economics (GRE).

The term *constitution* is used here in a methodological and disciplinary sense. GRE is still an emerging research programme, and its conceptual vocabulary remains open to revision through empirical inquiry, formal development, comparison with established economics, and criticism from neighboring disciplines. A preliminary constitution therefore does not fix an immutable doctrine. It makes explicit the commitments that currently organize the programme, the questions that distinguish it, the conditions under which a contribution can reasonably be described as GRE, and the domains in which theoretical disagreement remains legitimate. Such specification is necessary for cumulative research. An open programme becomes difficult to evaluate when its objects, boundaries, and standards remain entirely implicit; a rigid programme loses the capacity to learn when provisional commitments are transformed prematurely into protected axioms. Chapter 3 develops an intermediate institutional form: sufficiently explicit to support research coordination and sufficiently revisable to permit theoretical evolution.

The chapter begins from a domain distinction already established at the end of Chapter 2. Generative Relational Theory (GR) supplies a broader orientation toward relations, recursive generation, historical transformation, changing conditions of pos-

sibility, and the possible transformation of effective rules of change. GRE develops that orientation within economics. Its primary concern is therefore economic life: production, allocation, circulation, reproduction, labor, care, ownership, credit, valuation, institutions, technological infrastructures, ecological dependencies, economic power, and the distribution of future capacities. The broader GR framework can interact with law, political theory, education, ecology, history, aesthetics, artificial intelligence, and other domains, while GRE remains responsible for showing why a particular problem is economically significant and how its claims relate to economic evidence and existing economic knowledge.

This disciplinary positioning gives the chapter two complementary functions. The first is selective. GRE requires boundaries because relation and generation are extremely broad concepts. A study does not become GRE merely because it describes a network, identifies an interaction, invokes emergence, or discusses long-run consequences. The programme is organized around more specific analytical questions: how economic relations constitute subjects and objects; how allocations are mediated through relational configurations; how present arrangements generate later capacities, constraints, values, dependencies, institutions, and possibilities; who can access, mobilize, and shape generative capacities and the conditions that sustain them; how those effects propagate across scales; how heterogeneous forms of value are converted, circulated, captured, dissipated, or returned; how economic power alters generative conditions; and how the conditions that govern future change can themselves be transformed. The second function is pluralistic. These questions can be investigated historically, interpretively, qualitatively, quantitatively, causally, formally, computationally, normatively, and through intervention-oriented inquiry. GRE does not require a single privileged method or mathematical representation.

The chapter consequently moves from disciplinary identity to problem structure and then from problem structure to research architecture. It first specifies the scope of the emerging programme and the economic problems that motivate it. It then develops a minimal primitive vocabulary for ontological emergence and identifies the heterogeneous objects and scales that GRE may investigate. Subsequent sections formulate characteristic GRE questions and clarify the distinctive analytical movement from allocation through relational mediation, generation, propagation, conversion, recirculation, extraction, and structural transformation. The chapter then addresses economic subjecthood, the orientation of generation, modes of inquiry, epistemic commitments, praxis, normative evaluation, power, heterogeneity, disciplinary boundaries, and criteria for research contribution. Its final movement treats GRE as a cumulative and internally plural programme, states major open problems, maps the architecture of the wider research agenda, and offers a preliminary constitution that can guide later chapters without foreclosing revision.

Several restraints govern this constitutional exercise. Ontological suspension remains the default: useful relational, dynamical, network, field, geometric, or computational representations do not by themselves establish the ultimate ontology of economic reality. Descriptive generativity remains distinct from normative desirability: a relation can generate durable capacities or self-reinforcing structures while also generating domination, ecological damage, exclusion, or vulnerability. Representation remains distinct from represented reality: measures, categories, graphs, models,

and simulations are epistemic constructions whose adequacy depends on the local question and evidence. Finally, disciplinary openness remains reciprocal. GRE can borrow from neighboring traditions, and those traditions can expose GRE's errors, omissions, and domain limits.

The result is intentionally preliminary. Chapter 3 provides enough constitution for the rest of the book to proceed with a stable research language, while leaving empirical, methodological, formal, and normative disagreements available for later development. The subsequent chapters can therefore deepen GRE's ontology, epistemology, methodology, praxis, substantive economics, theories of power and justice, epistemic economy, artificial intelligence, and domain applications without repeatedly renegotiating the programme's most basic disciplinary identity.

3.1 Disciplinary Identity of Generative Relational Economics

The role of this section is to establish the preliminary disciplinary identity of Generative Relational Economics (GRE) before the chapter specifies its problem-space, objects, methods, and standards of contribution. Its objective is to explain what kind of intellectual formation GRE currently is, the scope within which it makes economic claims, and the commitments that give coherence to otherwise heterogeneous research practices. The argument proceeds from the transition between theoretical proposal and research programme to the scope of the field, the priority of economics as its primary domain, the organizing commitments of relation and generativity, and the conditions under which the programme should remain open and revisable. The method is constitutive rather than taxonomic: the section proposes a working disciplinary identity capable of coordinating research without presenting that identity as historically settled.

GRE is best understood at this stage as an *emerging economic research programme*. The phrase marks both ambition and restraint. It indicates an effort to organize a cumulative body of questions, concepts, methods, models, empirical inquiries, and normative debates around a distinctive analytical orientation. It also recognizes that GRE has not acquired the institutional history, stabilized professional community, canonical methods, or settled boundaries associated with an established discipline or mature subfield. Its identity therefore rests primarily on a coherent problem-space and a set of research commitments rather than on institutional recognition.

This distinction matters because the vocabulary of GRE ranges across several domains. Relations are studied throughout sociology, economics, anthropology, network science, political theory, ecology, and philosophy. Generation appears in theories of production, reproduction, development, evolution, emergence, innovation, complexity, and social formation. Value is central to economics and also to ethics, aesthetics, ecology, and political theory. Fields, trajectories, networks, capabilities, institutions, subject positions, and historical transformations already possess rich literatures of their own. GRE gains disciplinary identity neither by collecting these vocabularies under a new label nor by claiming ownership over their objects. Its identity arises from the specific economic questions produced when relational constitution

and downstream generation are treated together as sustained objects of inquiry.

A characteristic GRE inquiry therefore asks how an economic arrangement changes more than the variables administratively attached to its immediate recipient or transaction. An allocation of money, land, information, compute, credit, legal recognition, care, education, infrastructure, or technological capability enters an existing relational configuration. The allocation can alter capacities, dependencies, bargaining positions, recognition, expectations, institutional practices, ecological conditions, or access to later opportunities. These changes can propagate through further relations, be converted into other forms of value or constraint, become self-reinforcing, dissipate, or transform the conditions under which subsequent economic action occurs. GRE treats these downstream and relationally mediated effects as part of the economic object rather than as automatically external to it.

The programme remains compatible with narrower analyses when they are adequate to the question. A price model, accounting identity, causal estimate, institutional comparison, historical interpretation, network representation, ethnography, or simulation can each provide the most appropriate access to a local problem. GRE does not require every study to represent the full relational and generative field. Its disciplinary claim is instead that certain economically consequential phenomena become visible only when analysis can move between immediate allocation and the relations through which future capacities and constraints are produced. This claim defines a research orientation rather than a mandatory universal model.

3.1.1 From Theoretical Proposal to Research Programme

A theoretical proposal can be organized around a small number of concepts. A research programme requires a wider architecture. It must identify recurring problems, specify objects of inquiry, permit methods appropriate to different forms of evidence, distinguish stronger from weaker claims, accumulate comparative findings, expose itself to revision, and provide criteria through which researchers can disagree productively. GRE enters this second task in Chapter 3.

The transition is significant because relation and generativity can otherwise remain suggestive but underspecified. A relational statement may simply observe that economic actors are connected. A generative statement may merely report that one event has consequences for another. A research programme needs sharper questions. Which relations are constitutive of the economic situation? What entities and subject positions are stabilized through them? Which changes can reasonably be attributed to a relation or configuration rather than to coincident conditions? Through what mechanisms do effects propagate? Which forms of value are generated, converted, captured, returned, or destroyed? How do effects vary across scale and historical time? Under what conditions does a generative process reproduce itself? When does it alter its own conditions of continuation? What evidence would count against a proposed account?

These questions turn GRE from a vocabulary into a programme of inquiry. They also make possible disagreement internal to GRE. Researchers can disagree about whether a particular relation is constitutive or incidental, whether a claimed downstream effect is causal or interpretive, whether a state-space model preserves the

relevant distinctions, whether a value conversion is commensurable, whether an intervention strengthens capability or dependence, or whether a historical transformation changes only outcomes or changes the effective rules through which outcomes are produced. Such disagreements are productive when the disputed objects, assumptions, scales, and evidential standards are made explicit.

A research programme also requires cumulative structure. One study may identify a recurring relational mechanism; another may test whether it travels across institutional contexts; a third may formalize the mechanism; a fourth may show where the formalization fails; a fifth may examine its normative consequences; and an intervention study may alter the relation and observe how the surrounding system responds. The contribution of GRE lies partly in making these inquiries legible to one another. Historical interpretation, qualitative evidence, quantitative estimation, formal modeling, and normative analysis can then address different aspects of a shared problem without being forced into a single epistemic hierarchy.

The programme should therefore distinguish several levels of theoretical commitment. Some propositions will function as organizing hypotheses: for example, that present economic relations can generate future capacities and constraints that are not well represented by immediate allocation alone. Others will be domain-specific empirical claims: a particular credit architecture may generate dependence under specified institutional conditions. Still others will be methodological proposals, formal representations, normative arguments, or exploratory analogies. Treating these levels as equivalent would weaken the programme. GRE becomes more rigorous when the standing of each claim is stated locally and can change through evidence or criticism.

The term *research programme* also protects GRE from premature closure. The field can contain competing accounts of generativity, alternative formal representations, and disagreements about value while retaining a recognizable common problem-space. A programme is strengthened when rival formulations expose assumptions that one formulation had made invisible. Internal plurality therefore becomes part of disciplinary development rather than evidence that the field lacks identity.

GRE's transition from proposal to programme can consequently be summarized through four requirements. It needs a stable enough vocabulary to support communication, a sufficiently explicit problem-space to distinguish relevant contributions, methodological openness appropriate to heterogeneous evidence, and institutionalized revisability through which its own categories can change. Later sections of this chapter elaborate each requirement. The disciplinary identity established here supplies their common orientation.

3.1.2 Scope of the Emerging Field

The scope of GRE is defined by an intersection rather than by a single class of objects. The first component is economic: the inquiry concerns production, allocation, exchange, circulation, reproduction, labor, care, ownership, credit, institutions, technology, ecological dependence, valuation, power, or other processes that materially organize economic life. The second component is relational: the analytical object includes relations or configurations through which subjects, capacities, constraints,

values, and opportunities are constituted or mediated. The third component is generative: the inquiry examines how those relations contribute to later states, possibilities, structures, or rules of change.

This intersection permits a broad empirical range while limiting conceptual inflation. A study of a labor platform can belong to GRE when it investigates how contractual, algorithmic, reputational, and infrastructural relations shape workers' future bargaining capacity, subject positions, dependence, or access to opportunity. A study of agricultural credit can enter GRE through the way financing relations reorganize production choices, ecological risk, household vulnerability, and later credit dependence. A study of education can become economically relevant to GRE when it examines the generation and distribution of capabilities, knowledge, credentials, networks, and future participation in production or exchange. A study of artificial intelligence can enter through changing productive capability, ownership of computational infrastructure, knowledge concentration, labor transformation, or new asymmetries in the capacity to generate economically consequential outputs.

The same objects can also be studied outside GRE, and that coexistence is expected. A legal analysis may focus on doctrinal validity, a sociological analysis on status relations, a psychological analysis on cognition, and a GRE analysis on the economic generation and distribution of capacities through the same institution. Domain boundaries therefore concern the primary research problem rather than exclusive ownership of empirical objects. Interdisciplinary work becomes especially important when the economic mechanism cannot be understood without juridical, cultural, ecological, technological, or political relations.

Scope also varies by temporal depth. GRE can examine immediate relational mediation, medium-term capability formation, long-run institutional reproduction, intergenerational effects, or transformations in the conditions that govern later change. The appropriate horizon depends on the generative claim. A microcredit intervention may require months or years to evaluate changes in debt dependence and productive capacity. An infrastructure investment may reorganize settlement, land value, ecological conditions, and institutional expectations over decades. Knowledge and educational processes can generate effects whose later manifestations are difficult to attribute to a single intervention. GRE therefore treats temporal horizon as part of research design rather than assuming that the period convenient for measurement is identical to the period relevant to generation.

The programme is similarly multiscalar. Generative effects can occur within persons, households, organizations, communities, markets, institutions, states, ecosystems, or transnational systems, and they can propagate across these levels. A policy that expands aggregate productivity can simultaneously weaken a local community's bargaining capacity; a household intervention can change community norms; an institutional classification can alter individual access to credit; a technological standard can reorganize international production networks. GRE does not presume that effects observed at one scale aggregate straightforwardly into effects at another.

A useful boundary follows from this scope. Relational complexity alone is insufficient to define a GRE contribution. Many systems contain numerous relations. GRE becomes relevant when the inquiry identifies an economically meaningful process through which relations contribute to generation, reproduction, transformation, dis-

tribution, or foreclosure. The analytical burden is therefore positive: the researcher should specify the relation, the generated object or capacity, the mechanism or interpretive pathway connecting them, the relevant scale and horizon, and the evidence appropriate to the claim.

This scope allows GRE to remain broad without becoming synonymous with social science. It welcomes interdisciplinary objects while retaining an economic center of gravity. It also leaves neighboring GR domains available for questions whose primary object lies elsewhere. The breadth of the programme is therefore an architecture of interfaces rather than a claim of disciplinary absorption.

3.1.3 Economics as the Primary Domain

GRE is constituted within economics because its motivating questions concern the organization of material and symbolic conditions through which economic life is produced and reproduced. Production, distribution, allocation, exchange, labor, care, investment, credit, ownership, technological capability, ecological dependence, institutions, and value formation remain central. The relational and generative vocabulary changes the analytical emphasis placed on these objects; it does not dissolve the obligation to engage economic mechanisms, evidence, and established economic explanations.

This primary-domain commitment has several consequences. First, GRE should be able to state what is economically at stake in an inquiry. A sophisticated relational description does not automatically become economic analysis. The researcher must connect the relational configuration to economically consequential capacities, constraints, valuations, flows, institutions, or distributions. Second, GRE remains answerable to existing economics. When a conventional model explains the relevant outcome more parsimoniously and with adequate empirical support, GRE has no disciplinary privilege that exempts it from that result. The programme earns analytical space by identifying dimensions that established representations omit or by connecting findings that remain separated across existing literatures.

Third, economics as the primary domain does not imply a narrow definition of economic value. Market prices, income, productivity, and output are indispensable in many inquiries, but economic life also depends on capabilities, care, ecological conditions, knowledge, institutional trust, infrastructure, social reproduction, and forms of relational value whose significance may be incompletely priced. GRE therefore studies how multiple forms of value enter economic processes, while preserving the distinction between economic relevance and universal commensurability.

Fourth, the economic domain contains both descriptive and normative questions. GRE can describe how a platform generates dependency or how an institution concentrates productive capacity without thereby deciding whether the arrangement is just. Normative inquiry enters when evaluative criteria are made explicit: distribution, capability, recognition, participation, ecological sustainability, generative justice, or other justified standards. Economics supplies part of the descriptive object; ethical and political reasoning remain necessary where evaluation exceeds positive explanation.

Fifth, the primary-domain commitment helps distinguish GRE from the wider GR

framework. GR can investigate generative relations in history, law, education, epistemology, aesthetics, governance, or other domains without reducing those domains to economics. GRE concerns those interfaces when they materially affect economic processes or when economic arrangements shape the neighboring domain. A legal rule governing property, for example, is relevant to GRE because it constitutes ownership relations, allocative authority, collateral possibilities, and future investment conditions. The same rule can simultaneously require independent jurisprudential analysis concerning legal validity, interpretation, or rights. The interface is real while disciplinary identity remains differentiated.

This differentiation is important for the future development of the research programme. Without it, GRE could expand until every relational phenomenon becomes an economic phenomenon and the term loses discriminative value. With an explicit economic center, interdisciplinary expansion becomes more rigorous: each borrowing must show what economic problem it helps explain and what aspects remain better handled by another domain.

Economics also offers GRE a demanding test environment because economic systems combine formal institutions, strategic behavior, material constraints, symbolic valuations, historical change, quantitative data, and normative controversy. A viable GRE research programme must therefore interact with several established modes of economic reasoning rather than relying on a single philosophical language. The field's disciplinary identity is strengthened when relational and generative claims produce better questions, better explanations, better empirical distinctions, or more adequate evaluations within this demanding domain.

3.1.4 Relation and Generativity as Organizing Commitments

Relation and generativity provide GRE with its two principal organizing commitments. Neither concept functions as a universal explanation. Relation directs attention to the possibility that economic entities, capacities, positions, and values are partly constituted through connections, dependencies, institutions, recognitions, and repeated interactions. Generativity directs attention to the possibility that present relations alter what becomes possible later. Their conjunction gives GRE its characteristic analytical movement.

The relational commitment begins from specification. A relation should be identified with enough precision to distinguish it from mere co-presence or statistical association. Depending on the inquiry, the relevant relation may involve ownership, exchange, debt, employment, care, authority, information, recognition, technological dependence, ecological dependence, legal standing, platform access, infrastructural connection, or another structured linkage. Relations can be direct or mediated, durable or episodic, formal or informal, symmetric or asymmetric, cooperative or exploitative, visible or weakly represented in available data. GRE does not require these differences to be collapsed into a common relational metric.

Relations can also be constitutive at different levels. A contractual relation may connect already recognized legal persons while simultaneously contributing to their later capacities. Other relations help constitute the relevant economic subject or object itself. Employment relations can stabilize occupational identities and access to

social insurance; credit relations can create debtor positions and classifications; platform rules can constitute categories of worker or seller; property institutions can define the objects over which exchange rights are recognized. Relational analysis therefore includes both interaction among entities and the relational production of entityhood.

The generative commitment adds temporal and counterfactual depth. A relation matters not only through its current state but through the capacities, constraints, structures, values, and subsequent relations it helps produce. Generation can involve accumulation, learning, reproduction, institutionalization, path formation, trust, dependence, lock-in, ecological change, innovation, subject formation, or the creation of new option spaces. Some generative effects amplify later agency; others narrow the range of feasible action. Many do both for different actors or at different scales.

GRE consequently treats generativity as descriptive before it becomes evaluative. A relation can be highly generative because it reliably produces further structures or capacities while remaining normatively objectionable. Monopoly power can generate entry barriers; surveillance infrastructures can generate behavioral control; debt can generate productive investment and also dependency; extractive institutions can reproduce themselves. The strength of a generative mechanism does not determine its justice. Normative orientation must be supplied through explicit evaluative argument.

The two commitments become especially distinctive when the generated effects alter the conditions of further generation. A subsidy can increase productive capacity; the expanded capacity can change market structure; the changed market structure can alter bargaining power and investment incentives; those changes can influence the design of subsequent policy. A technology can alter productivity while also reorganizing skills, ownership, infrastructure, and standards in ways that change which technologies can be developed later. At this point, economic analysis concerns more than a sequence of outcomes. It concerns transformations in the field of future possibility.

This recursive feature explains why GRE pays attention to what later chapters call generative conditions and effective rules of change. The language should remain modest. Many cases can be modeled adequately with fixed rules and changing state variables. Stronger claims about rule transformation require stronger evidence and clearer specification. GRE does not infer meta-level transformation merely because a system changes. It asks whether the mechanisms through which future states are produced have themselves been altered and what observations would support that inference.

Relation and generativity therefore organize research without dictating a single ontology or method. A historical study may reconstruct how property relations generated institutional persistence. A causal design may estimate how access to credit changes later productive capacity. A network model may represent diffusion through relational structure. An ethnography may identify meanings and recognition processes omitted by administrative data. A formal model may examine self-reinforcing dependence under specified assumptions. These inquiries share an orientation while preserving different evidential objects and standards.

The disciplinary identity of GRE resides in this organized plurality. Relation specifies the mediating architecture through which economic processes occur; generativity specifies the downstream production of capacities, constraints, values, structures, and possibilities. Their conjunction turns attention from isolated possession toward economically consequential histories of formation.

3.1.5 Openness, Revisability, and Disciplinary Development

An emerging research programme requires mechanisms for changing itself. GRE therefore treats openness and revisability as constitutive commitments rather than temporary concessions made during an early phase. Its concepts, categories, methods, and boundaries should remain corrigible through empirical failure, theoretical criticism, comparison with competing explanations, normative disagreement, and changes in the historical economy it attempts to understand.

Revisability begins with ontological suspension. GRE can use relational, processual, dynamical, network, field, geometric, or computational representations while leaving open the question of whether any one representation captures the ultimate ontology of economic reality. This stance permits formal development without transforming modeling convenience into metaphysical certainty. A network can be an excellent representation for one mechanism and an inadequate representation for another. A field model can capture distributed conditions while obscuring actor interpretation. A qualitative reconstruction can identify constitutive meanings that are difficult to parameterize while remaining unable to estimate population-level magnitude. Openness protects the programme from identifying one mode of access with reality itself.

Revisability also concerns the programme's own categories. Economic subjects, institutions, technologies, forms of labor, ownership arrangements, and modes of value production change historically. A research language adequate to one economic formation can become less adequate as new infrastructures and relations emerge. Artificial intelligence offers an obvious contemporary example: rapid changes in productive capability, knowledge generation, labor substitution and complementarity, compute ownership, and human-machine interaction may require categories that were less salient in earlier economic analysis. GRE's emphasis on historical generation would be inconsistent if GRE treated its own conceptual vocabulary as historically exempt.

The programme should therefore preserve records of theoretical change. When a category is revised, the earlier formulation should remain intelligible enough for researchers to understand what changed and why. This matters for cumulative inquiry. A field that silently changes the meaning of its central terms can create an appearance of agreement while losing comparability across studies. Explicit versioning of definitions, assumptions, measures, and model classes can make theoretical evolution a source of knowledge rather than a source of confusion.

Openness further requires external correction. GRE should remain answerable to mainstream economics, heterodox economics, economic history, sociology, anthropology, political theory, law, ecology, philosophy, computer science, and other relevant fields. The appropriate correcting discipline depends on the claim. A causal

claim can fail under econometric scrutiny; a historical claim can fail under archival evidence; a legal claim can misunderstand doctrine; an ecological model can omit biophysical constraints; a normative argument can rely on undefended values. Interdisciplinarity is therefore not only a source of concepts. It is a structure of accountability.

Internal pluralism performs a related function. Researchers working within GRE may prefer different ontologies, causal accounts, measures, formal systems, or normative theories. The field should permit such disagreement when the competing formulations remain explicit enough to compare. Productive pluralism differs from unrestricted eclecticism. Competing accounts should specify their domains, assumptions, explanatory targets, evidential support, and points of incompatibility. A programme grows when disagreement creates sharper tests and better distinctions.

Disciplinary development also depends on negative results and limits. A proposed generative mechanism may fail to replicate, operate only under narrow institutional conditions, or add little beyond an existing model. A relational representation may become computationally intractable without improving explanation. A broad concept of value may prove impossible to operationalize for a particular decision. Such findings belong inside GRE rather than outside it. A research programme that records only cases where its preferred vocabulary succeeds would gradually lose contact with the conditions under which that vocabulary is useful.

Finally, GRE should remain historically revisable in its normative orientation. The programme can state commitments to transparency, participation, non-domination, capability, ecological viability, generative justice, or other evaluative principles only by making their justification available for criticism. Historical change can reveal conflicts among values or forms of exclusion that an earlier framework failed to perceive. Normative learning therefore requires both continuity and openness: continuity sufficient to make commitments accountable, and openness sufficient to correct them.

The disciplinary identity proposed in this section is consequently provisional by design. GRE is an emerging economic research programme organized around relational constitution and generative consequence, committed to economics as its primary domain, open to methodological and formal plurality, and structured for revision through evidence and criticism. This identity is strong enough to distinguish a problem-space while remaining incomplete enough to learn from the research it enables. The next section can therefore move from the identity of the programme to the concrete classes of economic problems that give it substantive necessity.

3.2 The Problem-Space of Generative Relational Economics

The role of this section is to delimit the class of economic problems for which Generative Relational Economics (GRE) is intended to provide additional analytical leverage. Its objective is not to claim that these problems belong exclusively to GRE, but to identify the recurring situations in which analysis becomes incomplete when it stops at the immediate recipient, current output, present ownership, or a fixed description of economic actors. The section proceeds through nine problem families: relational

effects of allocation, downstream generation, access to generative capacity and conditions, value beyond possession and exchange, persistent asymmetry and power, changing economic subjecthood, symbolic abundance and representational instability, heterogeneous subjects and value structures, and transformation of future generative possibilities. The method is constitutive and problem-oriented. Each subsection identifies an analytical difficulty that already appears within economic life and states the additional questions that a generative-relational perspective places around it.

The problem-space of GRE begins from a simple observation with wide consequences: an economic intervention rarely terminates at the point where it is administratively recorded. A payment reaches a recipient, a loan enters a balance sheet, an educational opportunity is allocated to a student, infrastructure is installed in a locality, compute is assigned to an organization, legal recognition is granted to a category of actor, or information becomes available to a community. Each event can be represented as an allocation. Yet its economically consequential effects depend on the relations through which the allocated object becomes usable, convertible, reproducible, contestable, shareable, or restrictive. The immediate transfer is therefore one moment within a potentially longer generative process.

This does not make conventional measures irrelevant. Recipient-level outcomes, prices, quantities, income, productivity, ownership, expenditure, and welfare indicators remain indispensable where they answer the question at hand. GRE instead focuses attention on cases in which these measures capture only one layer of the economic transformation. The programme asks what new capacities, dependencies, relations, subject positions, institutional routines, representations, and later possibilities are generated after the administratively visible event. It also asks which possibilities are weakened, foreclosed, extracted, or displaced. The resulting problem-space extends economic analysis temporally, relationally, and across scales without presuming that every problem requires maximal complexity.

The eight problem families below are connected but analytically distinct. An allocation can alter future capability without changing formal ownership. A productive process can generate symbolic standing without generating transferable wealth. A capability asymmetry can remain benign in one relational configuration and become power in another. An artificial system can become economically consequential before its legal or moral subjecthood is settled. Symbolic abundance can expand expressive possibility while making evidence, attribution, and scarcity harder to stabilize. Heterogeneous actors can participate in one economic process while valuing its outcomes through partially incommensurable standards. GRE treats these differences as reasons to preserve a plural problem-space rather than compress them into one master variable.

3.2.1 Allocation beyond the Administrative Recipient

Many economic interventions are administratively organized around identifiable recipients. A household receives a transfer, a firm receives credit, a student receives a scholarship, a municipality receives infrastructure funding, a laboratory receives equipment, or a community receives access to a service. Administrative legibility requires such attribution because institutions must identify who qualifies, who re-

ceives, how much is transferred, and whether the transfer conforms to a rule. This recipient-centered representation is operationally necessary, yet it can be analytically narrower than the economic effects that follow.

An allocation enters a pre-existing relational environment. A monetary transfer can alter bargaining positions within a household, reduce dependence on one employer, enable mobility, change creditworthiness, or increase the capacity to support others. A scholarship can generate knowledge, recognition, networks, migration opportunities, future income, or new asymmetries between the recipient and those who remain excluded. Infrastructure can alter land values, mobility, ecological pressure, political expectations, and patterns of settlement. Access to compute can enable research, automation, surveillance, artistic production, or organizational concentration depending on surrounding capabilities and institutions. The economically relevant object is therefore often larger than the administratively named recipient.

GRE treats the recipient as an important entry point rather than the presumed boundary of analysis. The analytical task is to identify which relations are activated, weakened, or reorganized by an allocation and which downstream effects are sufficiently connected to the intervention to warrant inclusion. This requires boundary discipline. Expanding the field indefinitely would make attribution impossible and turn relational analysis into a description of everything connected to everything else. A GRE inquiry therefore needs to justify why particular relational pathways are economically material to the problem under study.

The extension beyond the recipient also changes how incidence can be understood. Formal receipt and effective benefit can diverge. A subsidy assigned to one actor may partly accrue to landlords, intermediaries, suppliers, creditors, family members, or platforms through price adjustment, contractual dependence, or relational obligation. Conversely, an allocation formally directed at one person can generate benefits for a wider group through care, knowledge sharing, network access, or local demand. Recipient-level accounting remains informative, while the relational incidence of an intervention can require a different map.

This problem becomes especially important where institutions evaluate success shortly after delivery. Immediate uptake can coexist with longer-term dependence, capability loss, market concentration, ecological degradation, or institutional displacement. The reverse is also possible: modest immediate output can generate durable capabilities whose value becomes visible only later. GRE therefore places the administrative recipient inside a wider temporal-relational field and asks how the intervention changes the conditions under which later economic action becomes possible.

The resulting problem is not simply one of externalities. Externality language often begins from a focal transaction and asks which effects fall outside the prices or decisions of the transacting parties. GRE can include such effects, but its concern is broader. Some downstream consequences are constitutive of the recipient's own future capability; others alter the identities and relations through which the original economic categories remain meaningful. The issue is therefore not only what spills outward from a transaction, but how an allocation participates in the production of a subsequent economic configuration.

3.2.2 Generation beyond Immediate Output

Economic analysis frequently evaluates a process through an observable output: units produced, income generated, services delivered, learning achieved, emissions reduced, jobs created, patents filed, or profits realized. Such outputs matter, yet a process can also alter the capacity to produce later outputs. GRE distinguishes these two analytical moments. Immediate output concerns what is produced within a defined interval or activity. Generative effect concerns how the process changes the capacities, relations, constraints, orientations, infrastructures, or rules through which subsequent outcomes may be produced.

The distinction is visible in ordinary economic life. Training can produce a credential while also changing confidence, professional networks, problem-solving capacity, and access to later institutions. A research grant can produce papers while also creating laboratories, datasets, collaborations, techniques, reputations, and future questions. A platform can produce convenience while also establishing standards, behavioral routines, data assets, dependency relations, and barriers to entry. Care can meet an immediate need while also maintaining the bodily, emotional, and social capacities through which later participation remains possible. A failed project can produce little immediate output while still generating knowledge about constraints, new alliances, or institutional learning.

These examples show why generativity cannot be inferred mechanically from output volume. High output can consume the capacities on which future production depends. A firm can raise short-run productivity by exhausting workers, degrading equipment, externalizing ecological costs, or eliminating slack needed for adaptation. An institution can increase publication counts while narrowing intellectual diversity. A resource boom can raise current income while weakening alternative productive capacities. Conversely, a process can appear inefficient in a short horizon because it invests in capacities whose effects are delayed or uncertain.

GRE therefore treats the temporal relation between present production and future productive possibility as a central economic problem. This includes positive generation, maintenance, regeneration, reproduction, depletion, and foreclosure. The relevant question is not whether every activity has downstream consequences; that proposition would be trivial. The research problem is to identify which downstream changes are economically consequential, through what mechanisms they occur, how durable they are, who can access them, and whether they remain reversible.

Generation also differs from simple multiplication. A process is generative in the stronger GRE sense when it changes the conditions under which later states can be produced. Replicating an identical output can matter economically, but repetition alone does not establish transformation of generative capacity. A production system becomes analytically interesting to GRE when participation, accumulated resources, learned practices, institutional recognition, or altered relations change what can subsequently happen. The generated object may be material, organizational, epistemic, symbolic, ecological, juridical, or relational.

This distinction creates a problem of attribution. Later capacities usually have multiple antecedents. A newly capable organization may have received funding, benefited from favorable regulation, recruited skilled members, inherited prior infras-

tructure, and learned from failed experiments. GRE should therefore avoid attributing the whole later capacity to one relation merely because the relation preceded it. Generative claims require mechanism-sensitive reasoning and calibrated scope. The field's interest in downstream effects increases rather than relaxes the burden of specifying how generation is believed to occur.

3.2.3 Access to Generative Capacity and Conditions

A further GRE problem concerns the difference between receiving what has already been generated and gaining effective access to the capacities through which new outcomes can be generated. Conventional distributive questions remain indispensable: who receives income, goods, services, assets, welfare, or other outputs? GRE adds a second layer by asking who can mobilize human, organizational, technical, institutional, or artificial generative capacity. It adds a third by asking who participates in shaping the conditions under which such capacity can exist, be maintained, and develop.

These layers become especially visible in economies organized around infrastructures. A subject can possess equipment yet lack the knowledge, networks, institutional recognition, data access, legal permissions, energy, compute, or organizational support required to make that equipment economically effective. Conversely, access to a powerful generative system can transform what a subject is able to produce even when the subject acquires little conventional property. The economically relevant object is therefore sometimes not the distributed thing itself but effective access to a configuration capable of producing later possibilities.

Artificial intelligence sharpens the problem because it can weaken one form of productive dependence while intensifying another. If artificial systems perform tasks for which subjects previously depended on other people's labor, some forms of human-to-human instrumental dependence may decline. Yet access to the artificial capacity can remain conditional on infrastructures, permissions, ownership, technical standards, energy, compute, or platform governance. A post-labor tendency would therefore not imply a post-political-economic condition. Dependence can migrate from labor-mediated access toward access to generative infrastructure.

GRE does not resolve these questions in advance by treating broad access, common ownership, decentralization, or generative autonomy as automatically desirable. Its constitutive task is narrower. It makes visible a problem that is easily obscured when analysis stops at current output: who can enter, mobilize, influence, maintain, and alter generative processes, and how are the conditions of such participation reproduced? Later chapters develop the associated theories of capital, power, exploitation, justice, and governance. Here the problem is included because it extends political economy from the distribution of generated value toward the organization of generative capacity and generative conditions without replacing the former question.

3.2.4 Value beyond Possession and Exchange

Possession and exchange provide powerful ways of organizing economic value. Ownership establishes claims over resources; exchange reveals willingness to trade un-

der particular conditions; prices coordinate decisions and permit aggregation across many activities. GRE retains these objects while addressing situations in which economically significant value depends on participation, relation, access, recognition, continued circulation, ecological condition, or future capability rather than possession alone.

A resource can have little value to an actor who lacks the relations required to use it. Data require interpretive and computational capacity. Credit requires institutional access and future repayment possibilities. Land depends on legal recognition, infrastructure, ecology, community relations, and permitted uses. Knowledge can gain value through dissemination and recombination rather than exclusion. Membership in a trusted network can create opportunities that cannot be transferred as a discrete owned object. Public infrastructures and commons can generate value through reliable shared availability. Care, reputation, cultural meaning, and institutional legitimacy similarly resist complete description through possession.

Value can also change form as it moves through relations. Economic resources can become educational capability, political access, symbolic standing, health, time, security, knowledge, or ecological resilience. These conversions are neither automatic nor necessarily commensurable. The same monetary amount can generate very different capacities under different institutional, bodily, geographical, or relational conditions. Conversely, forms of value that appear qualitatively different can sometimes be converted into economic advantage through mechanisms such as credentialing, collateralization, monetization, platform visibility, or legal recognition.

GRE treats these conversions as part of the economic problem because they influence who can participate in subsequent generation. The possession of a resource at time one may matter less than whether it can be converted into durable capability at time two. A person may formally possess information without possessing the literacy or authority required to act on it. A community may possess land while lacking political protection against dispossession. A researcher may possess an idea while lacking access to laboratories, collaborators, or publication channels. An organization may own technology whose value depends on ecosystems maintained by others.

This perspective also creates a problem of value trajectories. Value can circulate, recirculate, dissipate, be extracted, be destroyed, or become embedded in relations that outlast the originating exchange. An intervention that appears beneficial at one point may produce a later value transfer away from the original participants through debt service, rent, licensing, platform fees, intellectual-property claims, or unequal bargaining. Conversely, a resource can generate distributed value through open standards, shared knowledge, community infrastructure, or repeated reciprocal use.

The purpose of GRE is not to replace price with a universal alternative measure. Doing so would reproduce the commensuration problem in another form. The programme instead asks which forms of value are relevant to the generative process, how they are recognized or obscured, which conversions occur, and what is lost when heterogeneous values are forced onto one scale. Some studies may use monetary valuation; others may require capabilities, ordinal comparison, qualitative description, multidimensional indicators, or explicit acknowledgement of incommensurability.

The problem-space therefore includes a distinction between current value realiza-

tion and future value generation. An actor can possess valuable assets while occupying relations that reduce future autonomy or capability. Another actor can possess few assets while participating in institutions that generate durable access, learning, security, or collective capacity. GRE does not assume that future generativity should replace present welfare as the evaluative objective. It instead treats the relation between present value and future generative conditions as an economic question requiring explicit normative and empirical analysis.

3.2.5 Persistent Asymmetry and Economic Power

Economic relations routinely contain asymmetries. Actors differ in wealth, productive capability, knowledge, computational capacity, institutional access, bargaining position, vulnerability, mobility, legal recognition, and ability to exit a relation. Difference alone does not establish domination. A doctor and patient, teacher and student, infrastructure provider and user, or advanced technical system and ordinary user can possess highly unequal capabilities while participating in relations that remain mutually beneficial. The analytical problem is to understand when persistent asymmetry becomes economic power and how that power affects later generative possibilities.

GRE approaches power through the conversion of asymmetry into the capacity to shape another actor's options, dependencies, classifications, resources, risks, or future relations. Resource asymmetry can become power when one party controls access to necessities. Knowledge asymmetry can become power when one party can define the relevant evidence or obscure the consequences of a transaction. Institutional asymmetry can become power when one actor controls eligibility, procedure, or recognition. Exit asymmetry can stabilize dependence even where formal participation appears voluntary. Computational or informational asymmetry can allow one actor to predict, rank, personalize, or intervene in another's behavior at a scale the other cannot reciprocate.

This problem is generative because power can reproduce or deepen the conditions from which it arises. Control over capital can generate further capital; control over data can improve prediction and attract further users; institutional authority can shape the categories through which later authority is exercised; reputational advantage can increase access to opportunities that generate additional reputation. Such processes are not inevitable. Competition, law, collective organization, technological change, public infrastructure, and countervailing institutions can interrupt them. GRE is interested in the mechanisms that determine whether an asymmetry decays, persists, becomes self-reinforcing, or changes form.

Persistent asymmetry also complicates simple strategies of equalization. Some differences in skill, knowledge, role, or capability are produced by specialization and may be beneficial. Other differences may be difficult to eliminate or may arise continually through innovation. The problem for GRE is therefore not reducible to making actors identical. It concerns the relational conditions under which unequal capabilities remain compatible with meaningful participation, non-domination, contestability, access to alternatives, and the preservation of future capacity.

This issue becomes especially important under radical capability asymmetry. An

actor may rely on another whose productive, predictive, cognitive, financial, or infrastructural capacity is orders of magnitude larger. Traditional bargaining models can become insufficient when one party cannot meaningfully evaluate the other's capabilities, reproduce the service independently, or exit without severe loss. GRE treats such situations as economic problems of relational architecture. Governance may need to address access, reversibility, auditability, representation, fallback options, common infrastructure, or limits on conversion of capability into control.

The programme also distinguishes power from observable coercion. A relation can shape behavior through dependence, standards, defaults, classification, architecture, or anticipated exclusion without direct commands. Conversely, strong influence can sometimes arise from trust, expertise, or voluntarily delegated authority without amounting to domination. GRE therefore requires local analysis of mechanisms rather than treating every asymmetry as evidence of one universal power relation.

3.2.6 Subjecthood under Changing Productive Relations

Economic theories require some account of the actors who produce, exchange, consume, invest, work, own, decide, cooperate, and bear risk. These actors are often represented as given units for analytical purposes. That representation is frequently useful. Yet productive relations can also change the capacities, roles, identities, and recognition through which an actor counts as an economic subject. GRE treats this instability of subjecthood as part of its problem-space.

Industrialization transformed relations among workers, firms, households, professions, and states. Corporate forms created collective economic actors with legal capacities distinct from their members. Welfare institutions established categories of claimant, beneficiary, dependent, contributor, and protected person. Digital platforms reorganized relations among user, worker, producer, advertiser, seller, and data source. Contemporary artificial systems further complicate the picture by performing economically consequential tasks that were previously associated with human expertise, agency, authorship, coordination, or judgment.

The GRE problem is not to settle the metaphysical status of every possible subject before economic analysis can begin. It is to examine how economic systems assign, stabilize, contest, and transform subject positions. Legal status, contractual capacity, ownership, accountability, recognition, access to institutions, technological mediation, and productive participation can all affect who is treated as an actor and which consequences attach to that treatment.

Changing productive relations can also alter human subjectivity without replacing human subjects. A worker who collaborates with automated systems may become responsible for supervision rather than direct production. A creator working through generative tools may occupy changing relations to skill, attribution, originality, and ownership. A consumer can simultaneously become a source of behavioral data, content, training material, reputation signals, and network effects. A household member can become an economically visible care provider when institutions change the classification of care. Subject positions are therefore partly produced through the categories and relations of economic organization.

This creates problems for models that assume stable preferences, capabilities,

roles, or boundaries of agency across the period being analyzed. Participation in an economic relation can change what an actor knows, wants, can do, expects, or is permitted to become. These changes do not imply that subjecthood is infinitely fluid. Bodies, histories, institutions, legal status, material constraints, and persistent identities provide continuity. GRE's task is to identify which aspects of subjecthood are sufficiently transformed by economic relations to matter to explanation.

The problem also has distributive consequences. When productive systems redefine valued participation, some actors gain recognition while others lose it. Automation can reduce the market value of an existing skill while increasing the value of complementary judgment or coordination. Credential systems can open access while excluding actors whose competence is not institutionally legible. New categories can create rights and protections while also fixing identities in ways that become restrictive. GRE therefore studies subject formation together with the institutional conditions under which recognition generates capability or constraint.

3.2.7 Symbolic Abundance and Representational Instability

Contemporary economies increasingly operate through symbolic objects: data, classifications, scores, rankings, credentials, financial representations, software, models, digital identities, synthetic media, generated text, virtual assets, and machine-produced predictions. Symbolic production has become inexpensive in many domains, while attention, verification, trusted interpretation, and institutional recognition remain scarce. GRE treats this divergence between symbolic abundance and representational stability as a distinct economic problem.

A representation can influence economic reality even when it is incomplete. Credit scores affect access to lending; rankings affect applications and funding; metrics shape organizational behavior; maps and categories determine eligibility; recommendation systems alter visibility; forecasts influence investment; labels affect trust; and digital profiles mediate access to platforms or services. These representations do more than describe pre-existing actors. Once institutions act on them, they can change the relations and opportunities through which those actors subsequently develop.

Symbolic abundance intensifies this process because the cost of producing plausible representations can fall faster than the cost of verifying them. When text, images, claims, reports, credentials, signals, or forecasts can be generated at high volume, scarcity shifts toward provenance, attention, adjudication, trusted institutions, and the ability to distinguish meaningful variation from noise. Economic value can then accumulate around infrastructures that organize visibility and credibility rather than around content production alone.

Representational instability also arises when the underlying object changes faster than the categories used to represent it. Occupational classifications can lag behind new forms of work. Legal categories can lag behind technological capability. Statistical indicators can retain the same name while their social meaning changes. A model trained on historical data can continue producing stable outputs after the relations that made the historical pattern informative have shifted. The representation may remain technically consistent while its relation to the target becomes weaker.

GRE is concerned with this problem because representations participate in generative processes. A classification used to allocate resources can alter behavior, incentives, identities, and institutional structure. A ranking can change the population it was designed to rank. A predictive system can influence the outcome it predicts by affecting who receives attention or opportunity. A narrative about economic risk can alter investment and thereby change the risk environment. Representation is therefore both epistemic and potentially causal.

This does not mean that symbols possess autonomous power outside institutions and practices. Their effects depend on recognition, enforcement, infrastructure, interpretation, and material consequence. A score ignored by all relevant actors remains economically weak; the same score embedded in lending, hiring, insurance, or governance can become highly consequential. GRE therefore studies the relation among symbolic objects, institutional uptake, material allocation, and downstream generation.

The contemporary problem of symbolic abundance also raises questions about knowledge capital. If the production of codified knowledge becomes much cheaper, advantage may shift toward actors who control data, evaluation systems, distribution channels, trusted identities, proprietary infrastructure, or the capacity to convert symbolic output into institutional action. The economic structure of knowledge can therefore change even when information becomes more abundant. GRE treats this as a problem of changing generative conditions rather than assuming that abundance automatically produces equal access or equal capability.

3.2.8 Heterogeneous Subjects and Value Structures

Many economic models gain tractability by representing actors through a common set of variables or a shared metric of preference and welfare. Such representations can be highly informative when the relevant differences are commensurable. GRE also addresses situations in which subjects differ more deeply: in embodiment, cognition, temporal horizon, vulnerability, institutional status, ecological dependence, forms of agency, or the values through which outcomes are interpreted. Heterogeneity then becomes a constitutive feature of the problem rather than a residual variation around one common type.

Heterogeneous subjects can still enter economic relations. A child and guardian, patient and care institution, local community and multinational firm, present generation and future generation, human user and artificial system, or human economy and ecological system may be connected through exchanges, dependencies, constraints, and value creation even where their capacities and evaluative structures differ sharply. The analytical challenge is to represent the relation without pretending that the parties are equivalent or completely mutually intelligible.

Value heterogeneity intensifies this challenge. Economic decisions can involve income, autonomy, cultural continuity, ecological integrity, security, dignity, recognition, knowledge, aesthetic significance, collective identity, and future possibility. Some of these values can be monetized for particular purposes; others resist stable conversion or lose important meaning when reduced to price. Conflict can therefore arise not only over the distribution of one value but over which values should count,

how they should be represented, and who has authority to decide.

GRE approaches heterogeneous value through explicit pluralism. A study may compare several value dimensions, trace conversions among them, identify institutional priorities, or describe conflicts that remain partially incommensurable. The aim is not to prohibit aggregation. Aggregation can be indispensable for decision and coordination. The requirement is to distinguish the practical need for a decision rule from a claim that the underlying values are intrinsically reducible to one scale.

Heterogeneity also affects generative relations because the same intervention can expand one subject's capabilities while narrowing another's. Infrastructure can increase mobility while degrading an ecosystem or displacing a community. Automation can reduce routine labor while expanding organizational capability and concentrating control. Open information can increase public access while exposing vulnerable individuals. A generative process therefore needs to be indexed to subjects, scales, and value dimensions rather than described as generative in an unqualified sense.

The GRE problem-space consequently includes coexistence under incomplete commensurability. Economic relations often need to continue even where actors do not share one ontology, one value function, one time horizon, or one conception of flourishing. Governance then concerns the design of relations that preserve participation, contestability, translation, and revisability under difference. This is an economic issue whenever resources, capabilities, risks, and future possibilities are allocated through those relations.

The problem should also be distinguished from simple diversity. Diversity describes variation among actors or values. Heterogeneity in the stronger GRE sense becomes analytically significant when the differences affect what can be compared, exchanged, represented, or jointly generated. A heterogeneous relation may require several descriptive languages at once. Economic analysis must then resist both premature unification and the opposite conclusion that comparison is impossible.

3.2.9 Transformation of Future Generative Possibilities

The deepest extension in the GRE problem-space concerns interventions that change not only current states or future outcomes, but the space of possibilities from which later economic processes can unfold. An intervention can create new capacities, remove constraints, alter institutions, establish standards, transform expectations, reorganize infrastructures, generate new subject positions, or change the relations through which subsequent innovation and coordination occur. GRE refers to this family of problems as the transformation of future generative possibilities.

The distinction can be illustrated through capability formation. Education does not merely raise an output variable at the moment instruction occurs. It can change which problems a person can recognize, which institutions can be entered, which collaborations become possible, and which future learning can be undertaken. Infrastructure does not merely deliver a service. It can alter settlement patterns, market access, technological adoption, and the feasibility of later investments. Legal reform can change not only current entitlements but the range of organizations, contracts, claims, and collective actors that can subsequently exist.

Technological platforms provide another example. A platform may begin as an intermediary and later become infrastructure on which other actors build businesses, identities, communities, data practices, and standards. At that point, changes to the platform's architecture affect a wide field of downstream possibilities. The economically relevant question extends beyond current user surplus or firm revenue toward the distribution of capacity to create, exit, interoperate, and develop alternatives.

Future possibility can also be narrowed. Debt can finance productive investment while creating obligations that restrict later choices. Monopoly can generate efficient infrastructure while reducing the space for alternative innovation. Environmental degradation can increase present output while eliminating future ecological options. Surveillance infrastructures can improve prediction while normalizing forms of control that become difficult to reverse. Educational standardization can improve comparability while reducing curricular diversity. These processes are generative in the sense that they shape future conditions, even where what they generate is constraint or foreclosure.

GRE therefore distinguishes generation from desirable expansion of possibility. More possibilities are not automatically better, and some constraints are constitutive of valuable order. Legal prohibitions can protect persons and ecosystems; technical standards can make cooperation possible; professional norms can sustain trust; ecological limits can preserve future viability. The analytical problem is to identify which possibilities are enabled or foreclosed, for whom, at what scale, through what mechanism, and according to which evaluative commitments.

Transformation of future possibilities also makes reversibility important. Two interventions with similar current benefits can differ greatly if one preserves exit and revision while the other creates lock-in. Reversible experimentation can support learning under uncertainty. Irreversible infrastructure, ecological change, institutional centralization, or path-dependent standards require stronger attention to long-horizon effects because later actors inherit conditions they did not choose. GRE therefore treats temporal asymmetry between present decision and future revisability as economically significant.

At the strongest level, an economic process can alter the effective rules through which later change occurs. A new legal form can change what organizations may be created. A communication infrastructure can transform how markets and communities coordinate. Artificial intelligence can alter the cost and distribution of cognitive tasks, thereby changing which activities are scarce and which forms of expertise remain economically valuable. Political-economic reforms can change not only allocations but the procedures through which future allocations are decided. The system's later transformations then occur under conditions partly generated by earlier transformations.

This does not imply that future possibility can be mapped exhaustively. Novelty, uncertainty, reflexivity, and incomplete knowledge place limits on prediction. GRE therefore treats generative possibility as an object of inquiry under uncertainty rather than as a fully enumerable state space. Researchers can identify enabling conditions, constraints, path dependencies, option structures, mechanisms of lock-in, and observed capability formation without claiming complete knowledge of the futures that may emerge.

The nine problem families together delimit the initial problem-space of GRE. Allocation can propagate beyond its administrative recipient; production can transform future productive capacity; access to generative capacity and conditions can diverge from receipt of generated outputs; value can depend on relations and conversion rather than possession alone; asymmetry can become self-reinforcing power; productive relations can reshape economic subjecthood; symbolic abundance can destabilize representation and shift scarcity toward verification and institutional recognition; heterogeneous subjects can remain economically connected without complete commensurability; and interventions can reshape the future conditions under which generation itself occurs. These problems share no single mechanism and should not be collapsed into one model. Their common feature is that economically consequential change exceeds the immediate state that conventional accounting or transaction-level description may record.

The next step is therefore conceptual rather than empirical. If GRE is to investigate these problems without presupposing a fixed ontology of entities, agents, relations, or values, it requires a minimal vocabulary from which richer economic objects can later be constructed. The next section introduces that primitive structure through change, structure, constraint, and difference, while retaining ontological suspension regarding their ultimate metaphysical status.

3.3 Primitive Structure for Ontological Emergence

The problem-space specified in the preceding section requires GRE to speak about entities, subjects, relations, capacities, institutions, values, and fields. Treating those objects as unquestioned primitives would, however, reintroduce many of the assumptions that a generative-relational analysis is intended to examine. The role of this section is therefore to establish a weaker conceptual starting point from which richer economic objects can become analytically available. Its objective is to specify four primitive distinctions—change, structure, constraint, and difference—and to explain how their interaction can support the emergence and stabilization of more determinate configurations. The discussion proceeds from each primitive separately to their interaction, the emergence of relative stability, ontological suspension, and multiple realization. Its method is constitutive and minimal: the section states the weakest commitments currently required by GRE while leaving stronger metaphysical claims open.

The term *primitive* is used here in a methodological sense. A primitive is a distinction that the present analytical framework takes as available before introducing more articulated objects. It is not thereby asserted to be metaphysically fundamental, indivisible, timeless, or ontologically prior in every possible theory. Another formalism may decompose one of these primitives further, replace it with a different basis, or represent the same empirical problem through another ontology. GRE's purpose in selecting a primitive structure is practical and epistemic: to begin with concepts weak enough to avoid presupposing the entities and relations whose emergence the programme may later wish to explain.

This choice also prevents a common circularity. If an economic subject is defined

first and its relations are then studied, the analysis can miss processes through which subjecthood itself depends on recognition, law, infrastructure, classification, productive organization, or repeated participation. If a relation is defined first as a link between already constituted nodes, the analysis can miss cases in which the relation contributes to the differentiation or persistence of the nodes. If an institution is treated as a fixed background, the analysis can miss how repeated practices maintain or transform the institution. A minimal primitive structure postpones these commitments. It asks first what changes, what organization makes those changes intelligible, what conditions restrict or enable possible transformations, and what differences become consequential within the configuration.

The four primitives should not be imagined as four substances or four separable components of an economic system. They are analytical dimensions that become meaningful through one another. Change without structure is difficult to identify because change requires some organization within which a transformation can be distinguished. Structure without change becomes analytically inert because structure is known through persistence, variation, reproduction, or transformation. Constraint presupposes a space of possible differences or transitions whose accessibility is conditioned. Difference becomes economically consequential when a structure renders it perceptible, operative, classifiable, or capable of altering later possibilities. Their interaction supplies a minimal grammar for describing ontological emergence while leaving the ontology itself under suspension.

3.3.1 Change

Change is the first primitive because GRE studies economic processes in which later conditions differ from earlier ones. The minimal concept is deliberately broad: change designates a transformation that can be distinguished between configurations, positions, capacities, relations, classifications, rules, or other analytically relevant conditions. This formulation does not presuppose that the thing changing is already an entity with a fixed identity. It permits the identity, boundary, or kind of the relevant object to become part of the change being studied.

Several levels of change should therefore remain distinct. A variable can change while the relations among variables remain similar. A relation can form, intensify, weaken, reverse, or dissolve while the participating terms remain sufficiently stable for the relation to be tracked. A structure can change when patterns among multiple relations are reorganized. A constraint can change when possibilities previously unavailable become accessible, or when previously accessible transitions become costly, prohibited, or practically unreachable. A classificatory or representational regime can change when actors are newly recognized, grouped, valued, or rendered visible. At a still stronger level, the effective rule through which later transformations occur can itself be modified. GRE eventually requires all of these possibilities, yet the primitive concept of change remains weaker than any one of them.

Change is therefore not synonymous with movement along a pre-specified coordinate. Many economic models legitimately represent change in exactly that way: price changes, employment changes, output changes, wealth changes, or probabilities change within a stable variable system. GRE retains such representations wher-

ever they answer the research question. Its additional interest appears when the variable system itself is historically unstable. A category such as employment may change in prevalence while retaining a stable legal meaning, or the legal and organizational meaning of employment may itself be transformed by platform work, contracting arrangements, automation, or new institutional classifications. The first case can be represented as change within a category; the second includes change in the category's constitutive conditions.

This distinction also separates state change from generative change. A state can differ at two times without the transition altering the capacity to produce later states. By contrast, a generative change modifies some condition through which subsequent possibilities are produced, selected, stabilized, or foreclosed. Training that raises a measured skill level is a state change; when the training also alters future access to occupations, networks, credentials, confidence, or learning capacity, the economic significance includes a generative dimension. A regulation that changes a current price is one kind of intervention; a regulation that changes entry conditions, bargaining institutions, or the incentives through which future market structure develops reaches a different level of change.

The concept must also accommodate maintenance. Persistence across time can require continuous activity. A bridge remains usable because inspection and repair occur; a currency remains accepted through continuing institutional and social practices; an organization persists through recruitment, routines, accounting, authority, and repeated recognition; a relation of trust can remain stable because encounters repeatedly confirm expectations. In such cases, apparent sameness at the level of an outcome is produced through ongoing change at other levels. GRE should therefore avoid equating observable stability with absence of process.

Change also carries no intrinsic normative direction. Transformation can enlarge capability, reduce vulnerability, create knowledge, or regenerate ecological conditions. It can equally generate dependency, exhaustion, exclusion, concentration, ecological loss, or irreversible foreclosure. Even a change described as innovation is not thereby beneficial to all affected subjects. The primitive records transformation; the normative evaluation of that transformation requires additional criteria developed later in the programme.

Finally, change is always specified relative to an analytical resolution. A firm may appear unchanged because it retains the same legal identity while its workforce, technology, ownership, dependencies, and internal authority are transformed. A person may appear occupationally unchanged while the meaning and security of the occupation are altered. A market may display stable aggregate shares while the underlying network of suppliers becomes more concentrated. GRE therefore requires the researcher to state which differences count as changes for the local question and which dimensions are being held provisionally constant. This dependence on resolution will become important when the programme later treats scale, boundary selection, and representation.

3.3.2 Structure

Structure provides the organization within which changes and differences become intelligible. In its minimal GRE sense, a structure is a pattern of organization that relates distinguishable components, positions, transitions, or conditions with sufficient regularity to support analysis. The term does not require a single formal representation. A structure may be institutional, relational, spatial, temporal, legal, organizational, symbolic, ecological, computational, or represented through several of these descriptions at once.

This minimal definition matters because structure is often confused with rigidity. GRE instead treats structure as compatible with extensive internal change. A labor market can preserve a recognizable structure while workers and firms enter and exit. A legal system can preserve institutional continuity while rules are amended. A network can preserve a degree distribution or community pattern while particular ties change. A household can remain an administratively recognizable unit while roles and resource flows are reorganized. Structural persistence therefore concerns patterned organization at a selected resolution, not immobility of every constituent.

Structure can also exist at several analytical levels. A local structure may concern the arrangement of a small number of actors or resources. A higher-order structure may concern patterns among relations, institutions, or categories. Structures can be nested, overlapping, or partially incompatible. The same economic subject may simultaneously occupy a workplace hierarchy, a household division of care, a credit relation, a legal status, a platform ranking system, and an ecological dependency. No single structure necessarily exhausts the subject's economic position.

For GRE, structure becomes especially important when it shapes how an intervention propagates. The same allocation can have different effects under different structures because access, conversion, visibility, bargaining, and recirculation differ. A cash transfer received within a predatory debt relation may partly flow to creditors. A research grant enters a university structure that conditions hiring, procurement, intellectual-property ownership, publication, and career recognition. Access to compute can generate different capacities depending on whether technical knowledge, electricity, data, institutional permission, and collaborative networks are available. Structure therefore mediates the relation between an initial resource and the later configuration it helps produce.

Structure also helps distinguish a merely repeated occurrence from a stabilized pattern. Repetition alone can result from coincidence or independent causes. A structural claim is stronger: it proposes that the recurrence reflects an organization of relations, positions, rules, or constraints that makes certain patterns more likely, durable, or reproducible. Such claims require evidence appropriate to the domain. GRE should not infer structure from visual regularity alone; qualitative mechanisms, institutional rules, historical evidence, statistical relationships, network organization, formal models, or combinations of evidence may be needed.

Importantly, structure can itself be an outcome of prior generation. Infrastructure, property regimes, professional categories, organizational routines, standards, market conventions, and technical architectures are historically produced. Once established, they can condition later behavior and appear to subsequent actors as part

of the environment. This temporal layering is central to GRE because generated structures can become conditions of future generation. The analytical movement is therefore recursive: processes generate structures; structures condition later processes; later processes may reproduce, erode, or transform those structures.

Structure should consequently be treated as relative to both scale and time. A relation that looks transient at one temporal scale may contribute to a stable pattern at another. A structure that appears fixed during a short intervention study may be historically recent. A national institution can function as background in a firm-level analysis while becoming the primary object in a comparative institutional study. GRE's minimal concept of structure supports these shifts without requiring that one level be declared ontologically fundamental.

3.3.3 Constraint

Constraint concerns the conditioning of possible transformation. A constraint limits, channels, raises the cost of, delays, redirects, or otherwise modifies which changes are available to a configuration under specified conditions. This definition is intentionally broader than prohibition. Constraints can be hard or soft, formal or informal, material or symbolic, local or distributed, immediate or historically accumulated. They can reduce some possibilities while enabling others by stabilizing expectations, protecting boundaries, supplying standards, or coordinating action.

The enabling dimension is important. A legal rule constrains conduct while also making contracts, organizations, ownership claims, or collective action more reliable. A technical standard restricts admissible designs while enabling interoperability. A professional norm narrows acceptable practice while supporting trust. A budget constraint restricts expenditure while helping define feasible planning. Physical infrastructure limits movement to available routes while making high-volume movement possible along those routes. GRE therefore treats constraint as a transformation of an option space rather than as a synonym for oppression or deprivation.

Constraints differ in the mechanisms through which they operate. A material constraint may arise from energy, time, geography, bodily capacity, or resource availability. An institutional constraint may arise from law, organizational authority, eligibility criteria, property rights, or administrative procedure. A relational constraint may arise from dependence on another actor, obligations, network position, reputation, or bargaining asymmetry. A cognitive or epistemic constraint may arise from limited knowledge, inaccessible information, uncertainty, interpretive categories, or attention. A technological constraint may be embedded in interfaces, protocols, platforms, or computational architectures. These forms can interact, and the same observed limitation can often be generated through several different mechanisms.

Constraint is therefore relational in a weak but important sense: a condition constrains only relative to some possible transformation of a specified configuration. The absence of advanced compute does not constrain a task that requires none. A licensing rule may constrain an unlicensed entrant while enabling established professionals to coordinate around a recognized standard. A language barrier can constrain access in one institution and become irrelevant in another with translation infrastructure. The researcher must specify whose possibilities are conditioned, which

possibilities are at issue, and through what mechanism the conditioning occurs.

Constraints can also be inherited. Present actors confront conditions generated by earlier processes that they did not choose: debt structures, infrastructures, ecological degradation, historical exclusions, educational systems, legal categories, standards, and accumulated concentrations of capital or knowledge. Such inherited constraints can be highly durable even when no current actor intends their continuation. GRE's concern with generation therefore includes the production and transmission of constraints across time.

At the same time, constraints are often transformable. Actors can acquire resources that relax a constraint, organize collectively to alter a rule, invent technologies that change material limits, reinterpret categories, create new infrastructures, or exit relations that previously restricted them. An intervention can also exchange one constraint for another. Credit can relax a liquidity constraint while introducing repayment obligations. Digital platforms can reduce search costs while increasing dependency on ranking systems or data infrastructures. Automation can relax labor bottlenecks while creating new capital, compute, energy, or skill dependencies. Analysis should therefore trace transformations of the constraint structure rather than classify interventions simply as constraint-reducing.

GRE also distinguishes constraint from deterministic closure. A constraint can make a transition improbable without making it impossible, and it can make a transition formally possible while rendering it practically inaccessible. Conversely, the absence of a known constraint does not imply that a possibility will be realized. Capacities, orientations, coordination, chance, and additional conditions also matter. This distinction will later be important for economic power: asymmetry can influence option spaces and the conditions under which choices are made without reducing action to mechanical determination.

3.3.4 Difference

Difference supplies the discriminations through which change, structure, and constraint can be described. In its minimal GRE sense, a difference is a non-equivalence, contrast, distinction, gradient, or differentiation that is relevant to a specified analysis. The primitive does not assume that every observable variation is economically meaningful. A difference becomes analytically consequential when it participates in identification, interaction, selection, valuation, constraint, or subsequent generation.

This distinction between variation and consequential difference is central. Two actors can differ in height without that difference affecting a particular credit relation. They can differ in legal status in a way that radically alters eligibility, bargaining, mobility, or vulnerability. Two firms can differ in size without that difference determining market power in one industry, while in another industry scale can transform access to data, compute, distribution, or finance. GRE therefore asks how a difference enters the relational configuration and what later effects follow from its recognition or operation.

Difference can be prior to a relation, produced through a relation, or amplified by a relation. Participants may enter an exchange with different resources or capabilities. The exchange may itself create new differentiation through learning, reputa-

tion, debt, ownership, or access. Repeated interactions can amplify an initially small difference through cumulative advantage or self-reinforcement. Conversely, institutions can reduce the economic consequences of a difference through insurance, universal provision, accessibility design, anti-discrimination rules, redistribution, or shared infrastructure. The economic significance lies in the generative trajectory of the difference, not merely in its presence.

Difference also participates in the constitution of categories. Economic systems routinely classify workers, firms, borrowers, residents, consumers, citizens, dependents, owners, professionals, risks, assets, and forms of labor. Such classifications make some differences institutionally salient while suppressing others. A category can convert a continuous variation into a discrete administrative distinction, or combine heterogeneous cases under one label. Once institutionalized, the classification can affect access, rights, prices, obligations, visibility, and self-understanding. Representational differences can thereby become causally effective within economic life.

The primitive must remain distinct from inequality. Inequality is a more specific relation involving unequal quantities, positions, opportunities, burdens, capabilities, recognition, or powers. Difference is logically weaker. Heterogeneity can be economically valuable, neutral, complementary, conflictual, or unjust depending on how differences are organized and evaluated. GRE's later treatment of heterogeneous subjects depends on preserving this distinction; a plural economy need not aim at eliminating difference, while justice may require intervention when particular differences are converted into avoidable domination or exclusion.

Difference is also scale-relative. Two configurations can be equivalent for one analytical purpose and different for another. Two households may have the same income while differing in care burdens, health needs, legal status, housing security, social networks, or exposure to environmental risk. Two firms may have identical revenue while differing in ownership, dependence on a platform, ecological footprint, or accumulated knowledge. An economic representation always selects which differences to preserve. GRE therefore treats the choice of relevant difference as part of the epistemic architecture of inquiry rather than as a transparent property of the world.

This point prevents the primitive from becoming an unlimited invitation to complexity. A research design cannot preserve every difference. The analytical task is to justify which distinctions matter to the proposed generative mechanism and to test whether omitted differences undermine the explanation. Difference thus supports pluralism while remaining disciplined by the local research question.

3.3.5 Interaction among the Four Primitives

The analytical value of the primitive structure lies primarily in interaction among its terms. Change, structure, constraint, and difference should rarely be interpreted as independent explanatory variables. Each modifies the meaning and operation of the others. A difference can alter a transition; repeated transitions can stabilize a structure; a structure can convert some differences into effective constraints; a constraint can preserve a structure by narrowing available transitions; and structural change can create new differences and remove old ones.

Consider a simple economic sequence. Two actors begin with a difference in access

to finance. An institutional structure determines which forms of collateral are recognized. That structure constrains borrowing possibilities differently across the actors. The resulting difference in investment capacity alters later income, asset ownership, reputation, and access to finance. Repetition can stabilize a configuration in which the original difference is amplified and incorporated into a more durable structure. The example does not require the researcher to declare wealth, creditworthiness, institutions, or even the actors themselves to be ontological primitives. It can begin from transformations, patterned organization, conditioned possibilities, and consequential distinctions, then introduce richer objects as the analysis becomes empirically specific.

The same primitive structure can describe generative expansion. Shared infrastructure may reduce a constraint on participation. Increased participation can create new differences in specialization and knowledge. Those differences can support a more complex division of labor. The emerging structure can generate additional resources, standards, and coordination capacities, which further relax some constraints while creating new ones. Generativity therefore need not mean monotonic liberation from constraint. New capabilities often depend on newly stabilized structures whose operation introduces obligations, dependencies, standards, or maintenance requirements.

The interaction among primitives also permits recursive analysis. A structure can constrain change, while changes can transform the structure. A difference can be produced by a constraint, while the resulting difference can later modify the constraint through political organization, market power, technological innovation, or institutional recognition. Constraint structures can become objects of economic investment; differences can become commodities, credentials, rankings, or legal statuses; structures can be deliberately designed; and change itself can be governed through procedures that determine how rules may be revised.

This recursion provides a bridge to the stronger GRE question concerning transformation of effective rules of change. At an initial analytical level, a researcher may ask how a configuration changes under a specified structure and set of constraints. At a second level, the inquiry can ask how those structures and constraints themselves change. At a third level, the procedures or mechanisms through which structures and constraints are transformed may become objects of inquiry. The primitive vocabulary can therefore support increasingly reflexive analysis without assuming that a single immutable law governs every level.

A useful discipline follows from this interaction: explanations should specify which primitive role a concept is playing at a given moment. The same institution can be treated as structure when its internal organization matters, as constraint when it conditions an actor's options, as difference when membership distinguishes eligible from ineligible actors, and as an object of change when reforms alter its operation. These descriptions are compatible because they answer different analytical questions. Confusion arises when movement among them occurs without being stated.

The primitive framework is therefore better understood as a grammar than as a taxonomy. It organizes questions about transformation without assigning each empirical object to one permanent category. This flexibility is important for economic

inquiry because the same phenomenon can change analytical status across scale and time. Money can be a resource in one analysis, a relation of credit in another, an institutional structure in a third, a symbolic representation in a fourth, and a constraint through liquidity requirements in a fifth. The primitives do not replace these richer categories; they clarify how such categories can be introduced without assuming their universality in advance.

3.3.6 Emergence of Stable Configurations

GRE requires relatively stable objects because economic inquiry cannot proceed by treating every moment as ontologically unique. Contracts, firms, households, states, currencies, property rights, professions, platforms, resources, and subjects must often be tracked across time. The primitive framework therefore needs an account of how stability can become analytically legitimate without turning stability into primordial substance. The concept of *stable configuration* supplies that bridge.

A stable configuration is a patterned organization whose continuity is sufficient for a specified analytical purpose across a relevant interval, scale, or set of transformations. Stability can arise through several mechanisms: material durability, repeated interaction, institutional recognition, legal enforcement, habit, technical standards, ecological reproduction, feedback, coordinated expectations, memory, documentation, or continual maintenance. These mechanisms need not produce permanence. They produce enough persistence or recurrence for the configuration to function as an identifiable object within the inquiry.

The phrase *sufficient for a specified analytical purpose* is crucial. A corporation can be treated as the same legal entity across changes in personnel and assets, while an organizational ethnography may treat those same changes as constitutive transformations. A currency can remain nominally the same while inflation alters its purchasing power and institutional reforms alter its governance. A household can persist administratively while membership changes. Entityhood is therefore resolution-dependent. GRE treats an entity as analytically real where the stability of a configuration supports explanation, measurement, interpretation, intervention, or coordination at the chosen scale.

Relations can stabilize in the same way. A relation need not be continuously active in order to persist. A debt relation remains operative between payments; a property relation persists while the owner is absent; a professional relation can survive periods without interaction; an institutional hierarchy can remain in force outside moments of explicit command. Persistence can depend on documents, expectations, enforcement, memory, infrastructure, or recognized roles. A stable relation is therefore more than repeated contact, yet it need not be a metaphysically independent object.

Stable configurations can also acquire causal and generative efficacy. Once a classification is institutionalized, it can govern eligibility. Once a platform becomes infrastructure, it can condition market access. Once a professional credential stabilizes, it can shape labor-market sorting. Once a norm becomes widely expected, deviations can become costly even without formal enforcement. An emergent configuration can thus become part of the structure and constraint environment faced by later actors.

Ontological emergence and generative recursion meet at this point: what was produced through earlier processes becomes a condition of later processes.

Stability should also be distinguished from desirability, efficiency, and equilibrium. A configuration can persist because exit is costly, alternatives are suppressed, coordination failure prevents change, or power reproduces the relevant conditions. Another configuration can be beneficial yet fragile because its maintenance depends on scarce resources or voluntary cooperation. GRE therefore treats persistence as an empirical property requiring explanation rather than as evidence of optimality.

The emergence of stable configurations gives GRE a principled basis for introducing richer objects in the next section. Entities, subjects, relations, resources, values, fields, institutions, and symbolic objects can be treated as first-class economic objects when their organization is sufficiently stabilized and their distinctions matter to the research problem. Their status remains historically and analytically conditioned. Stability licenses local objecthood; it does not establish final ontology.

3.3.7 Ontological Suspension

Ontological suspension is the discipline that keeps this primitive framework from becoming a dogmatic metaphysics. It means withholding claims about the ultimate constitution of economic reality when stronger ontological commitments are unnecessary for the local inquiry. Suspension permits the researcher to use entities, relations, processes, fields, networks, states, events, or other representations where they are analytically productive while keeping open the possibility that another representation may reveal different aspects of the same empirical configuration.

Suspension differs from ontological denial. GRE does not claim that entities are unreal because they are relationally constituted, that relations are unreal because they are represented through models, or that institutions are mere descriptions because they depend on recognition. A bank account, legal status, debt, organization, or technical standard can have robust economic consequences. Ontological suspension concerns the level of metaphysical assertion attached to those consequences. The researcher can treat an object as real and causally relevant within an inquiry without claiming that its current representation exhausts what the object is.

This position also differs from unrestricted constructivism. Economic objects can resist interpretation, produce unexpected effects, and impose material constraints regardless of the researcher's preferred description. A bridge has load limits; an ecosystem can be degraded; a debt contract can be enforced; a platform can deny access; a person can become exhausted. Ontological suspension does not dissolve these realities into discourse. It requires the analyst to distinguish the empirical resistance of a configuration from the categories used to describe it.

The discipline is especially important when formal methods are used. A graph can represent relations among nodes, a state space can represent possible configurations, a field can represent distributed conditions, and a simulation can explore consequences of specified rules. Each representation can be rigorous within its assumptions. None acquires metaphysical authority merely from mathematical precision. GRE therefore asks what distinctions the representation preserves, what it suppresses, which mechanisms it assumes, and whether alternative representations

change the substantive conclusion.

Ontological suspension also supports interdisciplinary communication. Economics, law, sociology, history, ecology, computer science, and philosophy can represent the same situation through different objects. A platform worker can appear as a labor supplier, contractual party, legal claimant, network node, data-generating user, organizational participant, or historically situated subject. These representations can conflict in specific claims while remaining jointly informative. GRE should compare their explanatory consequences before treating one vocabulary as universally privileged.

Finally, suspension creates a condition for theory revision. If entities, relations, and categories were fixed as final primitives, evidence that their boundaries change would threaten the coherence of the framework. A suspended ontology permits categories to be reconstructed when historical change reveals their limits. This revisability is particularly important to a programme concerned with the generation of new economic objects, technologies, institutions, and forms of subjecthood.

3.3.8 Multiple Realizations and Ontological Plurality

A minimal primitive structure also allows economically meaningful objects to have multiple realizations. The same functional or institutional role can be sustained through different material, organizational, legal, or relational configurations. Payment systems can be realized through cash, bank deposits, cards, mobile platforms, or other infrastructures. Collective production can be organized through firms, cooperatives, public institutions, households, commons, or loosely coordinated networks. Credentialing can be performed by universities, professional bodies, states, platforms, or community institutions. What counts as the same economic object therefore depends partly on the level at which equivalence is being claimed.

Multiple realization should not be confused with identity. Two configurations can perform similar functions while differing in power relations, vulnerability, ecological cost, accessibility, governance, or downstream generativity. A public payment infrastructure and a proprietary platform may both enable transactions while generating different dependencies and data relations. Two educational systems may produce comparable test scores while differing in social networks, institutional recognition, stress, curiosity, or future opportunity. GRE consequently treats functional equivalence as one possible relation among configurations rather than as proof that their broader economic consequences are equivalent.

The converse problem also occurs: similar manifestations can arise from different generative structures. Two workers can report the same income while one depends on a stable employment relation and the other on volatile platform work. Two firms can display the same output while one relies on durable local capabilities and the other on fragile external supply chains. Two communities can exhibit similar consumption while differing in debt burdens, ecological dependencies, public infrastructure, or informal care. Observable similarity therefore does not guarantee generative similarity.

Ontological plurality follows from these possibilities. GRE can permit several ontologies or representational schemes to coexist when they preserve different distinc-

tions relevant to the research question. An entity-centered model may be adequate for one task, a network representation for another, a process account for a third, and a field-like description for a fourth. Plurality is disciplined by explanatory and evidential adequacy rather than by an assumption that every representation is equally useful.

This pluralism has limits. Representations can contradict evidence, conceal relevant mechanisms, or impose categories that systematically misdescribe the subjects they classify. A plurality of possible descriptions does not eliminate standards of criticism. GRE should ask whether a representation preserves the differences relevant to the claim, whether its boundaries are justified, whether its entities remain stable enough for the inference being made, and whether alternative representations produce materially different conclusions. Ontological plurality therefore increases the burden of comparison rather than removing it.

Multiple realization also matters normatively. Policies often target administratively standardized objects such as households, firms, jobs, schools, or regions. If those categories have heterogeneous realizations, identical interventions can generate unequal effects. A household with the same measured income can face different care obligations; a firm of the same size can possess different network dependencies; a school with similar resources can operate within different linguistic, social, or infrastructural conditions. GRE's later analysis of heterogeneous subjects and values depends on recognizing that categorical sameness can coexist with generatively consequential difference.

The primitive structure developed in this section therefore establishes a deliberately modest ontological foundation for the programme. Change identifies transformation without presupposing a fixed bearer. Structure identifies patterned organization without requiring stasis. Constraint identifies the conditioning of possible transformation without implying deterministic closure. Difference identifies relevant non-equivalence without equating difference with inequality. Their interaction can generate relatively stable configurations that become legitimate objects of economic inquiry at specified scales and times. Ontological suspension prevents these objects from hardening prematurely into universal primitives, while multiple realization and ontological plurality preserve the possibility that comparable economic functions can be sustained through different configurations and that similar observations can arise from different generative histories.

This architecture is intentionally incomplete. It supplies the minimal conceptual conditions under which richer objects can be introduced; it does not yet specify which objects GRE should study. The next section can therefore move from primitive structure to the heterogeneous economic objects that become available once relative stability, analytical scale, and ontological suspension have been established.

3.4 Objects of GRE Inquiry

The primitive structure developed in Section 3.3 allows GRE to introduce richer objects without treating their present boundaries as metaphysically final. The role of this section is to specify the principal classes of objects that GRE may take as eco-

nomically relevant once relative stability, analytical scale, and ontological suspension have been established. Its objective is taxonomic rather than exhaustive: to identify a working repertoire of objects through which relational and generative economic processes can be investigated. The discussion proceeds from emergent entities and subjects to relations, resources and capacities, value, conditions and constraints, fields, temporal objects, institutions, and symbolic or representational objects. Its method is constitutive and pluralist. Each category is defined by the analytical work it can perform, while overlap among categories remains permissible where an empirical configuration supports several descriptions.

An *object of inquiry* in GRE is therefore an analytically stabilized referent around which a research question, body of evidence, mechanism claim, comparison, or intervention can be organized. Objecthood in this sense is local to an inquiry. A firm may be treated as an entity when the question concerns ownership or output, as a relational configuration when the question concerns authority and contracting, as an institutionally recognized subject when the question concerns legal responsibility, and as a trajectory when the question concerns organizational transformation. These descriptions are compatible when they preserve different economically consequential distinctions. GRE does not require a single vocabulary to carry every explanatory burden.

The admissibility of an object depends on several disciplines. Its boundary should be sufficiently explicit for the claim being made. Its persistence should be adequate to the temporal resolution of the inquiry. The evidence used to characterize it should correspond to the dimensions under discussion. Its role in a mechanism should be distinguished from the representation through which that role is inferred. Finally, the analyst should remain attentive to whether the object itself changes through the processes being studied. A category useful at the beginning of an inquiry can require revision if its constitutive relations, internal heterogeneity, or practical meaning change during the relevant history.

The categories below are therefore best understood as a research grammar. They help determine what GRE can study without implying that economic reality is naturally partitioned into ten mutually exclusive classes. Many of the most important GRE questions arise precisely where an object moves across categories: a resource becomes a capability, a repeated relation stabilizes into an institution, a symbolic classification becomes a material constraint, an event redirects a trajectory, or a distributed field of conditions contributes to the emergence of a new economic subject. The taxonomy is designed to preserve those transformations rather than eliminate them through premature classification.

3.4.1 Emergent Economic Entities

Economic analysis routinely refers to persons, households, firms, states, markets, sectors, technologies, assets, platforms, infrastructures, and other entities. GRE retains these objects while treating their entityhood as historically and analytically conditioned. An emergent economic entity is a relatively stabilized configuration that can be tracked as a distinguishable unit because some combination of boundary, continuity, recognition, organization, or causal coherence persists across the interval rel-

evant to the inquiry.

Relative stability is central. A corporation can remain the same legal entity while employees, ownership shares, technologies, contracts, products, and internal authority change. A household can remain administratively recognizable while membership, dependency relations, income sources, and care obligations vary. A market can persist as a named domain while its technologies, participants, rules, and geographic reach are transformed. GRE can treat each as an entity when the continuity is sufficient for the local question, while preserving the possibility that another question requires decomposition of the apparent unit.

Entity boundaries can arise through several mechanisms. Law creates juridical boundaries around corporations, contracts, property, and public authorities. Accounting creates reporting boundaries around organizations and transactions. Technical architectures distinguish users, devices, accounts, services, and platforms. Social recognition can stabilize occupations, communities, or organizational identities. Material organization can generate boundaries through infrastructure, geography, or ecological dependence. These boundaries differ in durability and authority. A legal boundary may remain stable while operational relations cross it extensively; an informal organization may have no independent legal personality while displaying strong internal continuity.

The economic significance of entityhood therefore depends partly on what the boundary permits the entity to do. Recognition can make ownership, contracting, taxation, liability, borrowing, representation, or participation possible. Entity formation can pool resources, concentrate decision rights, create collective capabilities, or separate responsibility. It can also obscure internal asymmetries by presenting a heterogeneous configuration as a single actor. Treating a firm, household, state, or community as one unit can be analytically efficient while suppressing differences in who decides, who bears risk, who receives value, and who remains unrepresented.

Entity emergence can itself become an object of explanation. A group of workers can become an organization; a technical project can become a firm; a loose exchange environment can become a recognized market; a digital protocol can acquire institutional governance; a collective practice can become a sectoral standard. GRE is interested in the conditions through which such configurations become sufficiently stable, recognized, resourced, and reproduced to acquire economic consequences as entities. The transition from diffuse activity to recognized entity can alter access to finance, law, infrastructure, legitimacy, and bargaining power.

Entities can also dissolve, fragment, merge, or migrate across classifications. Insolvency can dissolve a firm while parts of its productive capacity survive elsewhere. A public service can be privatized while its infrastructure remains materially continuous. A platform can reclassify workers without changing the practical dependence through which labor is organized. These cases show why GRE treats entity identity as a question of maintained distinctions rather than a self-evident fact.

The category of emergent economic entity consequently supplies a practical unit of analysis while keeping three questions open: which relations stabilize the entity, which boundaries make the entity economically actionable, and which transformations would make the existing entity description inadequate. These questions con-

nect entity analysis to the remaining object classes rather than isolating entities from them.

3.4.2 Subjects and Subject Positions

Subjects form a distinct class because economic participation involves more than the persistence of an entity. A subject occupies positions from which action, claim-making, evaluation, vulnerability, responsibility, recognition, or experience becomes economically consequential. GRE therefore distinguishes the existence of an entity from the constitution of a subject position. A corporation can be a juridical subject for some purposes without possessing human experience; a person can exist as a biological and social individual while being denied effective recognition as a worker, claimant, owner, borrower, resident, or political participant.

A *subject position* is a relationally and institutionally organized location from which rights, expectations, obligations, opportunities, exposures, or forms of agency become available. Employment status, citizenship, tenancy, creditor status, professional accreditation, platform membership, consumer classification, and eligibility for public support are examples of positions that configure economic possibilities. Such positions are often produced jointly by law, organizational rules, records, classifications, infrastructures, and recognition by other actors.

Subject positions can therefore change without the underlying person or organization disappearing. A worker can move from employee to contractor; a resident can gain or lose eligibility for a service; a borrower can be reclassified by a credit system; a community can become formally recognized as an eligible governance unit; a software agent can be delegated limited transactional authority. Each change modifies what the subject can do, what others may demand from it, and which relations become economically available.

GRE is especially interested in the generative consequences of these positions. A position can enable access to income, credit, education, information, legal remedies, social networks, or institutional voice. It can also create dependency, surveillance, liability, exclusion, or constrained exit. Because positions mediate later capacities, subject formation is not merely a descriptive question about identity. It can become part of the economic mechanism through which future options are generated or foreclosed.

This perspective also preserves the difference between subjecthood and agency. A subject can be strongly constrained while remaining economically consequential. Children, persons under guardianship, refugees, patients, dependents, or algorithmically classified users can occupy economically important positions even where their formal decision authority is limited. Conversely, an actor with substantial operational agency can remain weakly recognized within a legal or moral order. GRE should therefore specify which dimension of subjecthood matters to the inquiry: capacity to act, capacity to experience, standing to claim, institutional recognition, representation, accountability, or exposure to consequences.

Heterogeneity within subject categories is equally important. Administrative categories such as household, worker, consumer, student, patient, migrant, or firm can contain subjects with markedly different capacities and dependencies. Treating cat-

egory membership as sufficient description can obscure differences in language, disability, care obligations, wealth, access to networks, legal status, technical literacy, or exposure to institutional power. A GRE analysis can preserve the usefulness of the category while examining how its practical realization varies among subjects.

Subject positions can also be collectively constituted. A union, cooperative, community association, indigenous polity, professional body, or informal collective can acquire forms of representation and bargaining capacity that are unavailable to isolated members. Collective subjecthood can reorganize the field of negotiation, create shared resources, and alter the conversion of individual grievances into actionable claims. The relevant object is then neither a simple aggregate of persons nor a timeless collective substance. It is a stabilized configuration of representation, recognition, organization, and capacity.

The category will later support GRE's more detailed inquiry into human and artificial economic subjects. At the constitutional level, the key point is narrower: subjecthood is an economic object whenever the positions from which actors participate, experience consequences, make claims, or become governable are themselves generated, maintained, or transformed through economic relations.

3.4.3 Relations and Relational Configurations

Relations are central objects of GRE because economic consequences frequently depend on how actors, resources, institutions, and conditions are connected. A relation can involve exchange, authority, dependence, care, credit, ownership, recognition, information, obligation, trust, competition, cooperation, representation, access, or other structured forms of connection. GRE treats the relation itself as analytically available when its persistence, terms, or consequences matter to the research question.

Relations vary in their constitution. Some are formally specified through contracts, law, accounting, organizational rules, or technical protocols. Others depend on repeated practice, trust, custom, shared expectations, social proximity, or tacit coordination. Some are symmetric in a relevant dimension; others distribute authority, information, risk, or exit options asymmetrically. A relation can remain formally unchanged while its practical content shifts because one party's outside options, dependence, knowledge, or institutional protection changes.

Dyadic representation is useful for many questions, yet GRE also recognizes relational configurations that cannot be adequately decomposed into independent pairs. Supply chains, families, teams, communities, standards ecosystems, financial systems, platform markets, and public infrastructures often involve higher-order or multilayer dependencies. The significance of one tie can depend on the presence of several others. A credit relation, for example, can depend on legal enforceability, informational infrastructure, collateral arrangements, reputational systems, and monetary institutions. A labor relation can depend on household reproduction, immigration status, local labor demand, professional credentials, and collective bargaining institutions.

A *relational configuration* therefore refers to an organized set of relations whose joint structure has economically consequential properties. Concentration, brokerage,

segregation, reciprocity, redundancy, hierarchy, mutual dependence, and network closure can arise at the configuration level. These properties may affect bargaining power, diffusion, resilience, access, vulnerability, and capacity formation even when no single relation carries the full explanation.

GRE also distinguishes relations that connect already stabilized objects from relations that contribute to the constitution of those objects. A contract between two established firms may primarily coordinate exchange. Repeated recognition relations can help constitute a professional status. Care relations can contribute to the maintenance of persons' capabilities. Membership relations can constitute an organization. Legal relations can create ownership or corporate personality. The analytical question is therefore whether the relation is external to the identity relevant for the model, partly constitutive of it, or generative of a new stabilized object.

Relations can persist through material and symbolic infrastructures. A debt relation may be maintained through records and enforcement institutions; a platform relation through accounts, interfaces, ranking systems, and data; a professional relation through credentials and reputational networks. These mediating objects matter because they can change the relation without changing its nominal category. Digitization, automation, or legal reform can intensify monitoring, alter bargaining positions, reduce transaction costs, or enable new forms of exclusion within an apparently familiar relationship.

Relation formation and relation removal are themselves economically consequential events. Access to a mentor, lender, market, transport system, care network, professional community, or knowledge infrastructure can transform later opportunity. Loss of a relation can destroy capability even when material possessions remain unchanged. GRE therefore studies relational portfolios and configurations alongside stocks of individually held resources.

This category supplies the most direct bridge between the programme's relational commitment and ordinary economic inquiry. GRE does not require every explanation to be relation-first. It requires the analyst to make relation-dependent mechanisms visible where they materially alter economic outcomes, value trajectories, subject positions, or future generative conditions.

3.4.4 Resources and Capacities

Resources and capacities are distinct objects because possession or access does not by itself determine what an economic subject can do. A resource is something that can be mobilized, accessed, consumed, transferred, invested, preserved, or combined within an economic process. A capacity concerns an ability or practical possibility to act, produce, learn, adapt, participate, maintain, transform, or generate further possibilities. The relation between the two is mediated by context, institutions, skills, relations, infrastructure, bodily conditions, ecological conditions, and other conversion factors.

Resources can be material, financial, informational, institutional, social, technical, ecological, or symbolic. Land, equipment, money, time, data, legal rights, public infrastructure, credentials, reputation, access to a network, and environmental quality can each function as resources under appropriate conditions. Their resource char-

acter is relational because usefulness depends on what a subject can access and convert within a particular configuration. A database inaccessible to a community, a credential unrecognized by employers, or capital without complementary infrastructure can have limited practical value despite nominal possession.

Capacities likewise occur at several levels. Individuals can possess capacities for work, learning, judgment, mobility, communication, care, and political participation. Organizations can possess capacities for production, coordination, innovation, maintenance, adaptation, compliance, or collective learning. Communities can possess capacities for mutual support, governance, cultural reproduction, ecological stewardship, and collective action. Infrastructures can support capacities by making transport, communication, payment, identification, or knowledge access possible across many subjects.

GRE gives special attention to *generative capacity*: the ability of a configuration to produce or support further economically consequential possibilities. Education can generate later learning capacity; institutional trust can reduce coordination costs and enable cooperation; a research infrastructure can generate future knowledge; public health can preserve productive and participatory capacity; ecological regeneration can sustain future material possibility. Generative capacity is therefore temporally extended and often distributed across relations rather than located wholly inside a single actor.

The distinction between resource and capacity also clarifies why equal allocation can produce unequal outcomes. Subjects receiving identical monetary transfers can face different housing markets, care obligations, health conditions, legal statuses, network access, or local infrastructure. The same nominal resource can therefore generate different effective possibilities. Conversely, subjects with different resource bundles can sometimes realize comparable capabilities through different conversion arrangements. GRE is interested in the relational conditions that mediate these transformations.

Resources and capacities can also be depleted, captured, transferred, or rendered obsolete. Skill can lose market value after technological change; social capital can erode through displacement; ecological capacity can be exhausted; institutional capacity can decay through underinvestment; a public infrastructure can become inaccessible through privatization or pricing. These processes matter even when short-run output or consumption remains stable because they alter the future space of action.

Collective and relational capacities deserve separate attention. Some capacities exist only through coordination among several subjects. A payment system, scientific community, emergency-response network, common resource regime, or democratic institution cannot be reduced to the sum of individual skills. Their capability depends on maintained relations, standards, trust, interoperability, authority, and shared infrastructures. Disruption of those relations can destroy a collective capacity while leaving individual resources physically intact.

GRE therefore treats resources and capacities as related but non-equivalent economic objects. Resource analysis asks what is available and under whose control. Capacity analysis asks what actions or transformations become practically possible.

Generative analysis adds a further temporal question: how does the use, distribution, or transformation of present resources and capacities alter the production of later capacities?

3.4.5 Value and Forms of Value

Value is an object of GRE inquiry whenever economic relations create, recognize, transform, circulate, convert, preserve, capture, dissipate, or contest something treated as valuable. The category includes monetary price while extending beyond price to forms of value whose realization depends on use, relation, recognition, institutional standing, ecological condition, cultural meaning, capability, or future generativity. GRE therefore studies both valued objects and the processes through which value becomes intelligible, actionable, and convertible.

Forms of value should remain differentiated. Market value can be expressed through exchange prices under specified institutional conditions. Use value concerns usefulness relative to purposes and users. Social and relational value can depend on participation, belonging, trust, recognition, reciprocity, or the quality of continuing relations. Cultural and symbolic value can depend on meaning, status, heritage, identity, or collective recognition. Ecological value can concern the maintenance of living systems and material conditions that support present and future activity. Generative value concerns the production or return of capacities, resources, relations, knowledge, infrastructures, or other conditions that enable further generation.

These forms can interact without becoming automatically commensurable. A forest can carry market value as timber, ecological value as habitat and water regulation, cultural value for a community, and generative value through the capacities it sustains over time. A university can generate wages and patents while also producing credentials, knowledge, networks, civic capacity, and symbolic standing. A care relation can involve paid labor, emotional significance, capability maintenance, and institutional responsibility. GRE's task is to track these dimensions with enough separation to avoid converting plurality into a single metric before the research question justifies such conversion.

Valuation is therefore as important as value. Institutions, markets, professional communities, households, algorithms, legal systems, and cultural practices establish procedures through which some properties become visible and comparable. Accounting standards recognize certain assets and liabilities; credit systems assign risk categories; rankings convert heterogeneous characteristics into ordered representations; markets translate bids and offers into prices; communities maintain values that remain outside formal exchange. These valuation processes can affect the objects being valued by changing access, incentives, recognition, or behavior.

Value conversion creates a particularly important object of inquiry. Economic processes frequently transform one form of value into another: knowledge into income, reputation into access, public infrastructure into private profit, ecological resources into commodities, care into labor-market participation, or symbolic recognition into political and economic influence. Conversion interfaces distribute power because actors differ in their ability to authorize, measure, appropriate, or resist conversion.

The same relation can generate value for several parties while allowing only some of that value to be captured or monetized.

Value can also propagate beyond the initial transaction. Education provided to one person can contribute to household well-being, organizational capability, future teaching, or community knowledge. A technological standard can create value for complementary producers. A public transport investment can alter labor-market access and land values. These effects need not be reducible to externalities in a narrow sense; GRE can examine the pathways through which value becomes distributed across relational configurations and time.

Normative value requires additional care. Something can be economically valued without being normatively desirable, and a normatively important condition can remain weakly priced or administratively invisible. Profitability, efficiency, social importance, justice, and generativity are separate evaluative dimensions. Later normative sections of the programme can specify how such dimensions are assessed. At the object level, GRE preserves their distinction so that descriptive value processes do not silently determine normative conclusions.

Value thus enters GRE as a heterogeneous and dynamic object. The central questions concern which form of value is at issue, who recognizes it, through which relations it is produced or realized, how it moves or converts, who can capture it, what is lost in conversion, and how present valuations alter future generative conditions.

3.4.6 Conditions and Constraints

Economic action unfolds within conditions that shape which transitions are feasible, costly, legitimate, intelligible, or sustainable. GRE treats these conditions as objects when their distribution or transformation materially affects economic possibility. A *constraint* is a condition that restricts, redirects, or differentially prices possible action; an enabling condition expands or stabilizes practical possibility. The same configuration can perform both roles for different subjects, actions, or timescales.

Conditions can be material, ecological, institutional, legal, technical, social, epistemic, temporal, or spatial. Transport infrastructure affects geographic access; legal status conditions eligibility and enforceability; technical standards condition interoperability; language affects participation in institutions and markets; ecological limits shape production possibilities; time scarcity constrains care and learning; data access conditions computational capability; public safety affects mobility and investment. These conditions often operate before any explicit transaction occurs.

Constraints vary in strength. Some prohibit action through law or physical impossibility. Others increase cost, uncertainty, delay, or risk. Still others operate probabilistically by making some pathways easier to reproduce than others. A weak broadband connection, lack of childcare, inaccessible documentation, reputational stigma, or absence of collateral may not formally prohibit participation, yet each can substantially reduce practical access. GRE therefore studies the topology of feasible action rather than equating freedom with formal permission alone.

Constraints can also be relationally generated. Bargaining dependence can restrict exit; debt can condition future income allocation; platform design can constrain vis-

ibility; organizational hierarchy can restrict decision rights; social obligations can direct resource use; network position can limit access to information or opportunities. These constraints arise through relations and can persist even where no single actor consciously designs them.

Enabling conditions deserve equal analytical standing. Public infrastructure, trust, open standards, education, legal protection, care systems, stable ecological conditions, and interoperable institutions can make action possible across broad populations. Their economic contribution may be difficult to assign to individual transactions because they operate as background capacities. GRE can bring such enabling structures into view by asking which later activities depend on their continued reproduction.

Conditions can become endogenous to the processes they condition. Industrial activity can degrade ecological conditions; investment can improve infrastructure; repeated discrimination can reshape expectations and network access; successful coordination can build trust; institutional reform can alter transaction costs and enforcement. A condition that is treated as fixed in one local model can therefore become an outcome in a wider temporal or system boundary.

This category is especially important for intervention analysis. Policies frequently act by changing conditions rather than directly producing final outcomes. A guarantee changes perceived risk; a public option changes outside alternatives; a legal recognition changes standing; a subsidy changes relative cost; an information system changes observability. GRE can study these interventions by tracing how modified conditions alter relations, capacities, subject positions, and later trajectories.

Conditions and constraints thus provide the connective tissue between current configuration and future possibility. Treating them as first-class objects allows GRE to examine why identical resources or formal rights can generate different practical outcomes across subjects and contexts.

3.4.7 Fields and Distributed Structures

Some economic conditions are best represented as distributed structures rather than as possessions or pairwise relations. GRE uses the term *field* cautiously for configurations in which opportunities, pressures, meanings, incentives, risks, or capacities vary across a domain and affect actors partly through their position within that distribution. The field concept is an analytical resource rather than a commitment that social reality literally instantiates a physical field.

A distributed structure can be spatial. Land prices, transport access, pollution exposure, labor demand, public services, broadband quality, and ecological conditions vary across geographic space. It can also be institutional or social. Prestige, professional opportunity, credit access, political influence, or informational visibility can vary across positions in a social or organizational configuration. Digital environments add further domains in which ranking, recommendation, search visibility, platform rules, and data access are unevenly distributed.

Field-like representation is useful when the relevant condition cannot be assigned cleanly to a single actor or relation. A local labor market exerts pressures that emerge

from many employers, workers, institutions, transport networks, regulations, and expectations. A scientific field distributes prestige and attention through journals, institutions, funding systems, peer networks, and disciplinary categories. A financial environment shapes borrowing conditions through monetary policy, risk assessment, regulation, liquidity, and market expectations. No isolated tie carries the entire condition.

GRE can therefore study how distributed structures affect the formation and transformation of local relations. A person entering a region with abundant public transport and dense employment opportunities faces a different opportunity structure from an otherwise similar person in a poorly connected region. A small firm operating within an interoperable technical ecosystem faces different generative possibilities from one locked into a proprietary infrastructure. A researcher positioned in a highly visible institutional environment encounters different pathways for recognition and collaboration.

Fields can also be produced by accumulated local actions. Residential sorting can generate spatial concentrations; repeated investment can create technological clusters; platform participation can generate data advantages; institutional prestige can become self-reinforcing through hiring, funding, and citation. The distributed condition then feeds back into later local decisions. GRE is especially interested in these recursive situations because a field generated by past relations becomes a condition for future relation formation.

Boundaries of a field require explicit justification. The relevant domain may be a neighborhood, labor market, profession, platform ecosystem, jurisdiction, linguistic community, supply network, or ecological region. Different boundaries can reveal different gradients and dependencies. The researcher should therefore state what is distributed, across which domain, how position is measured, and which mechanism links the distributed structure to observed outcomes.

Field representations also help avoid attributing every effect to intentional action by identifiable actors. Unequal opportunity can arise through distributed historical structures even when no single current actor controls the whole configuration. At the same time, distributed structure does not imply absence of power. Some actors may possess disproportionate capacity to shape the field through infrastructure ownership, rule setting, investment, standardization, or control of classification systems.

Fields and distributed structures therefore enter GRE as meso- and macro-level objects that connect local relations with wider conditions. They prepare the transition to the next section's analysis of levels and scales by showing that the same economic process can be experienced locally while depending on structures distributed across a much larger domain.

3.4.8 Processes, Events, and Trajectories

GRE requires temporal objects because generation is inherently concerned with how present configurations produce later conditions. Processes, events, and trajectories provide three complementary ways of organizing temporal analysis. A process is an extended pattern of transformation or reproduction; an event is a temporally localized occurrence that changes or reveals a configuration; a trajectory is an ordered

history through a sequence of states, positions, relations, or regimes.

Processes can include accumulation, learning, institutionalization, technological diffusion, ecological degradation, care, maintenance, financialization, organizational growth, migration, professionalization, or the reproduction of inequality. Their identity depends on a pattern that persists through time even though the participating entities and local actions can change. Process analysis asks which mechanisms sustain the pattern, what inputs and relations it requires, and under which conditions its direction or intensity changes.

Events are analytically useful when temporally concentrated occurrences reorganize later possibilities. A bankruptcy, legal judgment, policy reform, infrastructure failure, technological release, merger, protest, disaster, discovery, or institutional recognition can redirect relations and expectations. The significance of an event is relational to its surrounding history. The same formal event can have different effects depending on preparedness, institutional capacity, network structure, or prior accumulation.

Trajectories preserve ordered history. Two subjects can arrive at similar present outcomes through different paths that leave different capacities, obligations, networks, expectations, or vulnerabilities. Equal current income can follow stable professional advancement, volatile gig work, inherited wealth, debt-financed education, or recent displacement. A cross-sectional measure can therefore conceal generatively important histories. GRE uses trajectory analysis to ask how sequences of relations and events shape present and future possibility.

Path dependence can arise through several mechanisms. Earlier choices can create switching costs, complementary investments, habits, classifications, reputational effects, or network structures that condition later choices. Institutional arrangements can make some transitions progressively easier and others harder. Learning can create cumulative capability. Trauma or depletion can reduce future adaptability. These mechanisms differ, so trajectory dependence should be specified rather than invoked as a generic explanation.

Temporal objects also allow GRE to distinguish maintenance from change. A stable institution or capacity may require continuous process. Public infrastructure must be repaired; professional competence maintained; ecosystems regenerated; trust reproduced; data updated; organizations staffed. A snapshot can therefore make a dynamically maintained condition appear static. Process analysis reveals the labor, resources, relations, and constraints required for persistence.

The timescale of a trajectory matters. A policy can improve short-run consumption while weakening long-run fiscal capacity; a technology can raise output while generating ecological or skill dependencies; a cost-cutting strategy can increase current profit while degrading organizational knowledge. GRE consequently studies trajectories across timescales rather than treating the immediate effect as a sufficient description of economic consequence.

Processes, events, and trajectories can themselves interact. An event can initiate a process; a process can accumulate conditions that make an event consequential; a trajectory can cross a threshold that changes the process governing subsequent evolution. These temporal objects therefore provide the language needed to connect cur-

rent intervention with future generative structure.

3.4.9 Institutions and Social Facts

Institutions and social facts are objects of GRE because economic possibilities are stabilized through rules, roles, classifications, expectations, conventions, recognized statuses, and recurring practices that exceed isolated transactions. Institutions organize who may act, under what authority, through which procedures, with which forms of recognition, and under which expectations of continuity. Social facts include collectively sustained realities whose economic consequences depend on shared recognition, repeated practice, or institutional support.

An institution should be distinguished from an organization. An organization is a relatively bounded collective entity; an institution is a stabilized pattern of rules, roles, norms, or practices that can operate across many organizations. A university is an organization, while credentialing practices, academic tenure, disciplinary review, or degree recognition are institutional arrangements. A bank is an organization, while money, deposit insurance, accounting standards, or secured lending involve wider institutions. The distinction matters because organizational change can occur within persistent institutions, and institutional change can reorganize many organizations simultaneously.

Institutions stabilize expectations. Contract law affects the expected consequences of agreement; property regimes organize control and transfer; professional licensing structures entry; welfare systems define eligibility; labor law configures employment relations; standards coordinate interoperability. This stabilization can reduce uncertainty and make complex cooperation possible. It can also preserve historically produced asymmetries by assigning differential rights, burdens, recognition, or access.

Social facts can become economically real through collective recognition and practical enforcement. Currency, credentials, corporate status, property claims, rankings, occupational categories, and reputations depend partly on recognition while producing material consequences. Their socially constituted character does not weaken their reality. A person denied a credential, account, license, or legal status can face direct material exclusion even though the relevant object exists through institutional and representational practices.

GRE is interested in how institutions are generated and reproduced. Repetition can stabilize conventions; law can formalize existing practices; administrative categories can create new subject positions; technical infrastructures can embed rules into routine action; organizations can reproduce institutions through hiring, reporting, and compliance. Institutional persistence therefore requires material, symbolic, and relational supports that can themselves become objects of economic analysis.

Institutions also transform the value and meaning of other objects. A dwelling becomes mortgageable property under specific legal and financial institutions. Data become tradable or restricted through regulatory and contractual regimes. A skill becomes economically valuable when recognized by employers or credentialing systems. A relationship becomes taxable, insurable, or legally protected when institutional categories recognize it. Institutions thus participate in converting material and social differences into economically actionable distinctions.

Institutional change can produce generative effects that extend far beyond the immediate rule modification. A new legal status can enable contracting, borrowing, inheritance, representation, or access to public support. A new technical standard can create markets for complementary products. A revised accounting rule can alter investment behavior. Because institutions condition many later relations simultaneously, their generative reach can be large even when the initiating intervention appears administrative.

The institutional object category therefore links GRE's analysis of stable social reality with its interest in historical transformation. Institutions provide continuity while remaining generated, maintained, contested, and revisable. Their durability makes them analytically powerful; their historical production prevents their present form from being treated as timeless.

3.4.10 Symbolic and Representational Objects

Economic life increasingly depends on symbolic and representational objects: prices, money, accounts, contracts, rankings, scores, categories, models, forecasts, identities, records, credentials, tokens, indices, dashboards, and algorithmic classifications. GRE treats such objects as economically consequential when representations mediate access, coordinate action, allocate attention, stabilize expectations, or alter the behavior of the subjects represented.

A representation should be distinguished from its referent. A credit score is not identical to a borrower's full financial condition; a ranking is not identical to institutional quality; a market price is not identical to every form of value; a model is not identical to the system modeled. The distinction matters because economic action often responds to the representation. A lender can deny credit because of a score, investors can respond to a rating, students can choose universities through rankings, managers can reorganize work around performance indicators, and public agencies can allocate resources through administrative categories.

Representations can therefore become performative or generative. Once a category is used for allocation, subjects may adapt behavior to satisfy it. Once a metric determines funding, organizations may reorganize activity around the metric. Once a risk model affects pricing, the resulting prices can alter the behavior on which future risk estimates are based. Representation enters the causal structure because institutions and actors use it to make decisions.

Symbolic objects also permit coordination across distance and scale. Money represents transferable claims; contracts encode obligations; accounting records organize complex organizations; technical standards encode compatibility; credentials communicate institutional recognition; databases preserve histories that can be acted upon by subjects who never directly observed the original events. These symbolic infrastructures expand economic coordination while creating dependencies on classification, record integrity, interpretability, and institutional trust.

The production of representations is therefore itself an economic process. Data must be collected, categories designed, models trained, records maintained, standards negotiated, and interpretations authorized. These activities require labor, infrastructure, expertise, and institutional power. Actors controlling representation

systems can shape which differences become visible and which forms of value become actionable. In data-intensive economies, control over classificatory and representational infrastructure can become a major source of economic power.

Representations also have error structures. Measurement can be noisy; categories can be incomplete; models can be misspecified; historical records can be biased; proxies can drift as behavior changes. A representation can remain administratively stable while becoming less adequate to the underlying configuration. GRE therefore treats representational validity as historically revisable. The question is not only whether a representation was accurate when introduced, but whether the relations between indicator, referent, and institutional use remain sufficiently stable for current decisions.

Symbolic objects can move across contexts and acquire new effects. A credential issued for educational recognition can become a labor-market filter. A social-media metric can become an advertising asset. A legal category can become a database field used in automated decision systems. A scientific indicator can become a policy target. Such movements can alter the meaning of the representation and the incentives surrounding it.

GRE's interest in symbolic and representational objects is consequently broader than a study of information. It concerns the economic relations through which representations are created, authorized, circulated, interpreted, converted into decisions, and recursively connected to the realities they describe. The distinction between relation and representation remains central: a representation can reveal a relation, simplify it, distort it, or participate in generating a new one.

The ten object classes developed in this section provide GRE with a plural repertoire for empirical and theoretical inquiry. Emergent entities supply relatively stable units; subjects and subject positions identify locations of participation, standing, experience, and exposure; relations and relational configurations make interdependence explicit; resources and capacities distinguish what is available from what can practically be done; forms of value identify heterogeneous objects of production, recognition, conversion, and evaluation; conditions and constraints organize feasible possibility; fields capture distributed structures; processes, events, and trajectories preserve temporal organization; institutions and social facts explain stabilized collective realities; and symbolic or representational objects make visible the classificatory infrastructures through which economic action is coordinated.

These categories should remain permeable. A corporation can simultaneously be an entity, a juridical subject, an institutional configuration, a bundle of capacities, a node in relational fields, and a trajectory. Money can be a resource, an institutionally stabilized social fact, a symbolic object, and a medium through which value is represented and converted. A platform can be an organization, technical infrastructure, field, relation-generating environment, classificatory system, and economic subject under different legal arrangements. GRE gains explanatory power from selecting the representation that preserves the distinctions relevant to the local question, while comparing alternative representations when conclusions depend on that choice.

Object selection is therefore inseparable from scale. An object stable at one level can decompose into heterogeneous relations at another; a relation local to one scale

can appear as a distributed field at another; an event for one subject can be part of a long institutional process at a wider temporal resolution. The next section turns explicitly to these levels and scales of inquiry, establishing how GRE can move among individual, organizational, collective, institutional, ecological, and transnational domains without assuming that the same objects retain identical boundaries across them.

3.5 Levels and Scales of GRE Inquiry

The objects identified in the preceding section become analytically meaningful only relative to a level and scale of inquiry. A household can be treated as an economic subject in one analysis, as a field of interpersonal relations in another, as a node in a credit or welfare network in a third, and as part of a larger demographic, ecological, or transnational configuration in a fourth. Generative Relational Economics therefore requires an explicit account of scale selection. The role of this section is to specify the principal levels at which GRE inquiry can be organized and to clarify how movement among levels affects what counts as an entity, relation, condition, mechanism, and consequence. Its objective is neither to impose a fixed micro–meso–macro hierarchy nor to deny the usefulness of scalar distinctions. It is to make scale an explicit analytical choice whose adequacy depends on the research question, the generative mechanism under study, and the evidential resolution available to the researcher.

Scale in GRE has several dimensions. A *spatial scale* concerns the geographic or material extent of a configuration. A *temporal scale* concerns the duration over which formation, persistence, transformation, or consequence is observed. An *organizational scale* concerns the level at which coordinated action is stabilized, from interpersonal relations to firms, states, transnational institutions, or distributed infrastructures. A *juridical scale* concerns the reach of rights, duties, jurisdictions, and recognized authority. An *ecological scale* concerns the material and living systems within which economic activity is embedded. An *analytical scale* concerns the resolution at which a researcher constructs objects and causal or generative claims. These dimensions can align, but they often diverge.

The distinction between *level* and *scale* is useful even when their boundaries remain context-dependent. A level identifies a position within a layered description, such as person, organization, institution, or transnational system. Scale identifies the extent or resolution of the phenomenon being observed. An organizational process can have a local spatial scale but a long temporal scale; an interpersonal relation can be embedded in a global platform infrastructure; a juridical rule can operate nationally while being produced through transnational negotiation. GRE therefore treats levels as analytical locations within an inquiry and scales as dimensions of extent, duration, or resolution. Neither should be assumed to map onto a single natural hierarchy.

This section proceeds across six recurrent domains of analysis—individual and interpersonal, organizational, community and collective, institutional and juridical, ecological and more-than-human, and inter-system and transnational—before turning to two cross-cutting issues: scale-relative entityhood and cross-scale generative

effects. The method is constitutive rather than classificatory in a rigid sense. The purpose is to define a usable architecture for GRE research while preserving the possibility that empirical cases require different or additional levels.

3.5.1 Individual and Interpersonal Scales

Individual and interpersonal scales concern persons, households, dyads, small groups, and recurrent relations whose immediate organization is accessible at the level of situated interaction. At this scale, GRE can study how economic capacities, constraints, expectations, obligations, identities, and values are generated through relations among concrete subjects. The focus is wider than individual choice in isolation. Choice remains important, but the inquiry asks how the conditions under which choices become available, intelligible, affordable, legitimate, or sustainable are relationally formed.

An individual can be analyzed as an economic subject with resources, preferences, capabilities, legal standing, knowledge, vulnerabilities, and temporal commitments. Yet these attributes frequently depend on relations that exceed the individual. Income can depend on employment relations; credit access can depend on institutional classification and social history; capability can depend on care, education, infrastructure, or recognition; preference formation can depend on social learning and available categories of action. GRE therefore treats individual-level observations as legitimate without treating the individual as analytically self-sufficient.

Interpersonal relations can themselves generate economic effects. Trust can reduce monitoring costs and make cooperation feasible. Care can maintain or expand another person's practical capacities. Advice can alter information, confidence, or opportunity. Repeated exchange can create expectations of reciprocity. Family relations can redistribute resources across time and persons. Friendship and professional ties can provide access to information, employment, finance, or institutional navigation. These effects can be valuable without being fully priced, and they can generate dependency or unequal obligation as well as support.

Households illustrate the importance of distinguishing the administrative recipient from the relational field. A transfer formally delivered to one household member can alter bargaining power, care allocation, educational investment, consumption, savings, mobility, or future exit options for several people. A wage increase can change household time allocation and dependency patterns. Debt undertaken by one member can constrain future resources of others. The relevant unit therefore depends on the mechanism being studied rather than on the administrative unit through which a programme or transaction is recorded.

Temporal scale is especially important at the interpersonal level. Some effects are immediate, such as payment, consumption, or access. Others accumulate through repeated interaction. Trust, skill, reputation, dependency, and caregiving capacity are often generated through histories rather than single encounters. A relation that appears beneficial over one month can create vulnerability over several years; a costly educational investment can generate capabilities whose effects become visible much later. GRE inquiry should therefore specify the time horizon over which an interpersonal relation is being evaluated.

The individual and interpersonal scale also reveals the difference between formal equality and relational position. Two persons may hold the same legal right while facing different exit costs, knowledge, network access, or dependence. Equal monetary transfers can have different generative effects because subjects occupy different relational configurations. This does not imply that every analysis must reconstruct the full social history of each person. It means that the scale of analysis should be broad enough to capture the relations necessary for the specific generative claim.

At this level, evidence can include interviews, ethnography, surveys, administrative records, experiments, transaction histories, diaries, social-network data, or mixed-method designs. The appropriate evidence depends on whether the claim concerns subjective meaning, observed behavior, resource flow, causal effect, relational structure, or long-horizon change. Individual-scale data do not automatically support interpersonal or institutional claims, just as aggregate data can conceal mechanisms operating through concrete relations.

The individual and interpersonal scale is therefore a legitimate entry point rather than a privileged foundation. GRE can begin with persons and direct relations when that resolution is adequate, while remaining prepared to enlarge the analytical boundary when the observed capacities, constraints, or trajectories depend on organizational, institutional, ecological, or transnational structures.

3.5.2 Organizational Scales

Organizational scales concern coordinated configurations that stabilize roles, procedures, decision rights, resource pools, routines, information flows, and boundaries of participation. Firms, public agencies, universities, hospitals, cooperatives, nongovernmental organizations, platforms, laboratories, and project teams can all become objects at this scale. The relevant question is not simply whether an organization exists as a legally recognized entity. GRE asks how organizational arrangements generate capacities and constraints for participants and how those arrangements reproduce or transform their own conditions of operation.

Organizations can pool resources that individuals cannot mobilize alone. They can create specialized roles, accumulate knowledge, establish infrastructure, coordinate long production processes, and distribute risk. They can also concentrate decision authority, create informational asymmetries, and determine access to opportunities. An organization therefore appears simultaneously as an emergent entity and as a relational architecture through which people, technologies, rules, and resources become coordinated.

Organizational boundaries are analytically important because many contemporary production processes extend beyond formal employment or ownership. A platform can rely on independent contractors, users, complementors, cloud providers, advertisers, moderators, data-labeling workers, and public infrastructure. A manufacturing firm can depend on suppliers distributed across jurisdictions. A university can rely on temporary researchers, publishers, funders, accreditation systems, and digital services. The legal boundary of the organization is one relevant boundary, but it may not coincide with the generative boundary of the economic process.

GRE can therefore distinguish between organizational membership and organiza-

tional dependence. A person may depend economically on an organization without being an employee. A community may bear environmental or infrastructural consequences of organizational activity without participating in governance. A supplier may become technologically locked into a dominant buyer. A public institution may depend on proprietary software whose provider sits outside its formal hierarchy. These relations affect the organization's generative reach and the distribution of benefits, risks, and future options.

Organizational scale also makes internal heterogeneity visible. Departments, teams, occupational groups, and technical systems can operate under different incentives and temporalities. A firm can appear coherent at the market level while containing conflicts over investment, labor conditions, safety, innovation, and accounting. An organization can therefore be treated as a unit for one research question and decomposed into internal relational configurations for another. The adequacy of aggregation depends on which mechanisms matter to the inquiry.

Organizational learning is one important generative process. Routines, archives, training systems, informal norms, and technological infrastructures can preserve knowledge beyond individual tenure. Conversely, turnover, outsourcing, or fragmentation can dissipate capabilities even when short-term financial indicators improve. Investment in organizational capacity can therefore generate future possibilities that are not visible in current output, while extraction from organizational knowledge or trust can reduce later adaptability.

Governance within organizations is similarly generative. Decision procedures determine whose information enters deliberation, which risks become visible, how conflict is resolved, and who can revise rules. Participation can create knowledge and legitimacy; concentrated authority can accelerate decisions in some contexts while suppressing local information in others. GRE does not presume one organizational form to be normatively superior across cases. It studies how specific governance architectures shape the production, distribution, and transformation of future capacities.

Organizational scale thus mediates between interpersonal relations and wider institutional structures. Organizations translate law, markets, technologies, and cultural expectations into local procedures, while their actions can reshape sectors, communities, standards, and political economies. Their analysis requires attention both inward to internal relational architecture and outward to the fields in which they operate.

3.5.3 Community and Collective Scales

Community and collective scales concern forms of coordination and shared dependence that do not necessarily coincide with formal organizational boundaries. Neighborhoods, professional communities, scientific fields, cultural groups, commons, mutual-aid networks, open-source communities, social movements, informal markets, and distributed publics can exhibit patterns of collective action without constituting a single organization. GRE includes these formations because economically consequential capacities can emerge through repeated participation, shared norms, common infrastructures, and distributed recognition.

A community can generate resources that are difficult to assign to individual producers. Shared knowledge, reputation systems, linguistic conventions, safety expectations, informal credit, professional standards, and norms of reciprocity can enable action across many participants. Their value often depends on continued collective reproduction. If participation declines, trust erodes, common infrastructure deteriorates, or knowledge ceases to circulate, the resource itself can weaken even when no discrete asset has been destroyed.

Collective scale also matters for the formation of economic subjects. Membership in a professional, cultural, or local community can provide categories through which people understand opportunities and obligations. Collective narratives can shape expectations about work, entrepreneurship, education, debt, care, or acceptable risk. These processes need not imply homogeneous values. Communities can contain disagreement, hierarchy, exclusion, and multiple overlapping memberships. GRE therefore treats collective identity as an empirical configuration rather than an assumption of unity.

Commons provide a particularly useful illustration. A resource can be collectively used and governed through rules that define access, contribution, monitoring, sanction, and adaptation. The relevant economic object is then neither only the resource nor only the individual user. It includes the relation among resource conditions, user practices, governance arrangements, and external pressures. Changes in any of these can alter the viability of the collective system.

Digital communities extend these issues beyond geographic proximity. Open-source projects, online knowledge communities, creator networks, and platform-mediated groups can generate software, information, cultural value, reputation, and social support through dispersed participation. Their infrastructures can nevertheless remain privately owned or technically centralized. A community can therefore be distributed at the level of participation while depending on concentrated control at the infrastructural level. This asymmetry becomes visible only when multiple scales are analyzed together.

Collective action can also produce public or quasi-public capacities. Community organizing may improve bargaining power; professional associations may establish standards; neighborhood networks may coordinate disaster response; scientific communities may produce shared methods and repositories. These capacities can benefit participants unevenly and can create boundaries around membership or recognition. GRE can study both the generative contribution of collective organization and the distribution of access to what is collectively generated.

The temporal scale of communities often exceeds individual participation. Institutions of memory, ritual, documentation, mentorship, and repeated practice can transmit norms and capacities across cohorts. At the same time, a community can transform rapidly under migration, technological change, political conflict, or economic restructuring. Analyses that treat collective structure as fixed can miss the processes through which membership, meaning, and governance are continually reproduced.

Community and collective scales therefore provide a middle range in which distributed relations acquire partial stability without necessarily becoming formal organizations. They are especially important for GRE because generation frequently

occurs through participation that is economically consequential yet only partially represented in contracts, prices, or administrative categories.

3.5.4 Institutional and Juridical Scales

Institutional and juridical scales concern relatively stabilized systems of rules, recognized roles, procedures, classifications, rights, duties, jurisdictions, and authorized decisions. At this scale, GRE studies how economic possibility is structured through the formal and informal arrangements that determine what can be owned, exchanged, licensed, enforced, recognized, taxed, subsidized, inherited, represented, or contested. Institutions are not merely background conditions. They actively generate categories of action and subject positions.

Law provides one especially explicit architecture of economic possibility. Corporate law makes certain collective entities legally actionable. Property law organizes claims over resources. Contract law structures enforceable commitments. Labor law defines employment relations and protections. Bankruptcy law redistributes consequences of failure. Immigration law can shape access to labor markets and public support. Intellectual-property law conditions the circulation and appropriation of knowledge. These arrangements alter incentives, but they also constitute the legal identities and relations through which economic action proceeds.

Juridical scale should not be reduced to national legislation. Municipal regulations, administrative agencies, courts, professional licensing bodies, treaty regimes, private arbitration systems, technical standards, and organizational rules can each exercise authority over different domains. Jurisdictions overlap, and actors can move or strategically position activity among them. GRE therefore asks which authority is operative for the relation under study and how jurisdictional boundaries affect the distribution of rights, risks, and generative opportunities.

Institutional categories can have constitutive effects. Eligibility rules determine who counts as a beneficiary. Accounting standards determine which assets and liabilities become visible. Educational credentials authorize access to professions. Credit classifications influence borrowing conditions. Statistical categories shape policy populations. Once institutionalized, such classifications can alter behavior and resource flows, thereby contributing to the reality they purport to describe.

Institutional scale also introduces temporal depth. Rules inherit prior conflicts and compromises; administrative routines accumulate; precedents stabilize expectations; legal categories outlive the conditions under which they were formed. Economic actors adapt to these structures, and repeated adaptation can create constituencies that support their continuation. Institutional persistence can therefore be generated through feedback among rules, investments, expectations, and organized interests.

Change at this scale can be discontinuous. A legal recognition, regulatory decision, court judgment, or policy reform can rapidly transform the feasible set of actions for many actors. Yet implementation remains relational. Formal change can produce uneven effects when local administrative capacity, information, infrastructure, or social recognition differs. GRE consequently distinguishes institutional rule change from the distributed processes through which a rule becomes effective in practice.

Institutional and juridical scales also mediate normative questions. Rights, procedural protections, and public obligations can constrain economically efficient arrangements for reasons of justice, dignity, or political legitimacy. Conversely, legal authority can stabilize extractive or exclusionary relations. GRE does not infer normative validity from institutional existence. It treats institutions as economically generative structures whose consequences and justification require separate evaluation.

This scale is indispensable whenever the relevant causal or generative mechanism depends on recognized authority. A transaction between two persons may appear interpersonal, yet its enforceability, tax treatment, property consequences, and admissible terms can be institutionally constituted. The juridical environment therefore enters GRE inquiry whenever it materially changes what relations can exist and what they can generate.

3.5.5 Ecological and More-than-Human Scales

Ecological and more-than-human scales concern the living, material, energetic, climatic, and technological systems through which economic activity becomes possible and consequential. GRE includes these scales because economic relations are embedded in conditions that are neither produced solely by human exchange nor adequately represented as passive inputs. Soil fertility, water systems, biodiversity, atmospheric conditions, energy infrastructures, animal populations, computational systems, and built environments can shape and be transformed by economic processes.

Ecological scale complicates conventional boundaries around the economic unit. A factory can be analyzed as an organization, but its production may depend on watersheds, energy grids, mineral extraction, transport corridors, and waste sinks distributed across large regions. Agricultural production can depend on pollination, soil microbiomes, climate patterns, seed systems, and water availability. The relevant generative configuration can therefore extend far beyond the spatial boundary of the producing organization.

Temporal scale becomes especially consequential here. Ecological regeneration, depletion, contamination, and climate effects can unfold over decades or generations. Short accounting periods can therefore classify an activity as productive while externalizing degradation of the conditions that make later production possible. GRE can address this mismatch by treating ecological conditions as part of the generative system rather than only as exogenous constraints encountered by economic actors.

More-than-human inquiry also raises questions about agency and subjecthood. GRE need not resolve a general metaphysics of non-human agency in order to study how animals, ecosystems, technical systems, or artificial agents participate causally in economic configurations. A river can constrain settlement and transport; a disease vector can alter labor and health systems; an algorithm can allocate visibility or credit; an automated system can modify production decisions. The analytical status of these participants should be specified relative to the claim being made rather than predetermined by a universal hierarchy of subjects.

Technological systems illustrate the overlap between ecological and organizational scales. Energy networks, communication infrastructures, logistics systems,

and machine-learning platforms have material footprints, operational dependencies, maintenance requirements, and failure modes. Their economic effects emerge through coupled human and technical relations. Treating technology as a neutral tool can obscure how technical architecture redistributes practical capacities and how its maintenance depends on resource extraction, labor, standards, and institutional support.

Ecological relations also generate value that can resist simple monetization. A wetland can support flood protection, habitat, cultural practice, recreation, and future ecological resilience. Assigning a price to one service can assist a particular decision while leaving other forms of value unrepresented. GRE therefore permits multiple valuation registers at ecological scales and requires transparency about which dimensions are included in a given economic representation.

More-than-human scales also expand the population affected by economic decisions. Future people, non-human organisms, and ecosystems can bear consequences without participating in present transactions. This creates a temporal and representational problem: current subjects make decisions under institutions that may weakly represent distant or non-speaking affected parties. GRE can study the mechanisms through which those absences become economically consequential without assuming that a single metric resolves the normative problem.

Ecological and more-than-human scales thus prevent the research boundary from stopping where conventional organizational or market boundaries stop. They make visible the material conditions, distributed dependencies, and long-duration transformations through which present economic generation can either sustain or erode future possibility.

3.5.6 Inter-System and Transnational Scales

Inter-system and transnational scales concern relations that cross organizational fields, institutional orders, jurisdictions, sectors, infrastructures, or national boundaries. Contemporary economic processes frequently operate through such crossings. Finance, migration, supply chains, digital platforms, scientific collaboration, humanitarian assistance, trade, energy systems, taxation, and data governance can connect actors governed by different rules and situated within different value structures. GRE therefore requires a scale at which interactions among systems become objects in their own right.

A transnational supply chain illustrates the problem. Production may involve design in one jurisdiction, components from several others, assembly elsewhere, finance through global institutions, shipping through international logistics, and consumption in distant markets. Labor rights, environmental rules, currencies, tax regimes, and political risks differ across locations. The economic relation cannot be understood fully through the bilateral transaction between buyer and seller because value generation and vulnerability are distributed across the chain.

Inter-system analysis is broader than geographic internationalization. Health systems can interact with labor markets; education systems with migration regimes; financial systems with housing; scientific systems with intellectual-property institutions; humanitarian systems with border governance. Each system can maintain

its own classifications, objectives, and evaluative criteria. Their coupling can create gaps, contradictions, or conversion points through which subjects gain or lose access.

Conversion across systems is therefore a central object. A qualification recognized in one jurisdiction may not convert into professional standing elsewhere. Financial capital can cross borders more easily than labor. Data can be generated in one legal environment and processed in another. Carbon emissions can be produced locally while their climatic effects are globally distributed. Humanitarian categories can determine access to assistance but interact imperfectly with immigration categories. GRE can study these interfaces as generative sites where differences among systems produce new capacities or constraints.

Transnational scale also changes the distribution of governance capacity. Some actors can choose jurisdiction, route investment, relocate data, restructure ownership, or negotiate directly with states. Others remain territorially or institutionally fixed. Mobility itself therefore becomes an economic capability. The ability to cross boundaries can alter bargaining power even when formal rules are equal within each jurisdiction.

Distributed infrastructures further complicate territorial analysis. Payment networks, cloud computing, communications, shipping, and digital identity systems can operate across many jurisdictions while being controlled by a limited number of organizations or standards bodies. Failure or policy change at one infrastructural node can propagate across distant systems. The relevant scale is then neither purely national nor simply global; it follows the architecture through which dependence and coordination are organized.

Transnational processes also operate across heterogeneous temporalities. Trade agreements, infrastructure investments, migration histories, debt contracts, and climate commitments can bind actors over long periods. Short-term political cycles may interact with long-term obligations. GRE can therefore examine how institutional time horizons become coupled and how present decisions distribute future adjustment costs across places and populations.

Inter-system and transnational scales are consequently necessary whenever the generative relation crosses the boundary of the system in which the initial action is recorded. They direct attention to interfaces, conversions, jurisdictional differences, infrastructural dependencies, and the unequal capacity to move among systems.

3.5.7 Scale-Relative Entityhood

The preceding scales reveal a central constitutional principle of GRE: entityhood is often scale-relative. A configuration that functions as a coherent entity at one analytical level can become a field of heterogeneous relations at another. A household can be a unit in a national survey and a contested relational configuration in an ethnographic study. A corporation can be a market actor in industrial analysis and a network of departments, contracts, algorithms, workers, and investors in organizational analysis. A state can be treated as an actor in international negotiation and decomposed into agencies, courts, political coalitions, infrastructures, and administrative practices in institutional analysis.

Scale-relative entityhood does not imply that entities are unreal. It specifies the conditions under which treating a configuration as an entity is analytically productive. Relative stability, boundary persistence, coordinated action, recognized identity, and causal integration can justify entity-level analysis. The same configuration can nevertheless be decomposed when internal structure becomes relevant to the question. Ontological suspension therefore supports practical realism: the analyst can work with entities while remaining open to changing the level of resolution.

Aggregation is one mechanism through which entities appear. Individual transactions can produce market-level regularities; organizational decisions can produce sectoral patterns; local ecological changes can accumulate into regional effects. Yet aggregation alone does not guarantee that the higher-level object has independent explanatory value. GRE asks whether higher-level patterns feed back into lower-level behavior, constrain possible transitions, or stabilize classifications and expectations. When they do, the higher-level configuration can become causally or generatively relevant in its own right.

Decomposition likewise requires care. Explaining an organization through individuals alone can omit rules, infrastructures, and emergent coordination. Explaining a legal order through statutes alone can omit administrative practice and social recognition. Explaining a market through transactions alone can omit standards, network effects, and institutional conditions. Reduction to a finer scale can therefore lose structure just as aggregation can conceal heterogeneity.

The choice of scale also affects attribution. If a worker acquires a skill, the generative contribution may involve individual effort, teachers, organizational training, public education, family support, digital infrastructure, and prior scientific knowledge. Different scales reveal different contributors. GRE should therefore match attribution to the level of the claim and avoid converting a multi-scale generative process into a single-agent narrative without justification.

Scale-relative entityhood also matters for normative evaluation. Benefits and harms can reverse appearance across scales. A firm-level efficiency gain can impose community-level unemployment; a household-level coping strategy can reproduce gendered burdens; a national growth policy can create ecological costs elsewhere; a local conservation rule can restrict livelihoods while sustaining long-run regional resilience. Evaluation should therefore state the population, temporal horizon, and scale to which a conclusion applies.

Remark 3.1 (Scale-relative entityhood)*.* Treating a configuration as an entity is a modeling and evidential commitment justified by the local inquiry. It does not require the same configuration to remain indivisible, homogeneous, or equally salient at other scales.

This principle gives GRE a disciplined way to move among levels without declaring one level ultimately fundamental. The research question determines the initial resolution, while empirical anomalies, mechanism evidence, or downstream effects can require expansion or decomposition of the analytical boundary.

3.5.8 Cross-Scale Generative Effects

Cross-scale generative effects occur when processes organized at one level alter capacities, constraints, structures, or possibilities at another. These effects are central to GRE because economic generation often propagates beyond the scale at which an intervention, transaction, or decision is initially observed. A scholarship allocated to one person can affect a household, professional network, organization, or future community. A local technological innovation can reshape industry standards. A national regulation can reorganize firm behavior and interpersonal opportunities. A transnational platform rule can alter the visibility and income of individual creators.

Cross-scale effects can move upward through accumulation, coordination, diffusion, or institutionalization. Repeated individual behavior can create market conventions. Local experiments can become organizational routines. Collective practices can become recognized standards. Distributed demand can support an industry. Social expectations can become politically salient and eventually codified. The relevant mechanism should be specified rather than assumed from the observation that lower-level and higher-level change occur together.

Effects can also move downward. Institutional classifications shape individual eligibility; organizational rules structure team behavior; market concentration alters bargaining conditions; national monetary policy changes borrowing costs; ecological degradation constrains household livelihoods. Higher-level patterns can therefore become conditions of lower-level action even when they originated historically from distributed processes.

Horizontal propagation across scales is equally important. A change in one sector can alter another through labor, finance, infrastructure, or regulation. A technological standard adopted by one industry can create complementary markets elsewhere. A health crisis can transform education, transport, employment, and care. These processes are not captured adequately by a single vertical hierarchy because the relevant systems can be partially autonomous yet strongly coupled.

Cross-scale generation can also involve delayed effects. Investment in early childhood can influence educational trajectories years later; infrastructure can shape settlement and productivity over decades; ecological damage can accumulate before crossing thresholds; institutional reforms can alter expectations gradually. A local analysis may therefore be accurate within its immediate horizon while incomplete for longer generative consequences.

Feedback among scales creates additional complexity. An organizational policy can alter worker behavior; aggregated behavior can change organizational performance; performance can lead to a revised policy. A legal reform can change market practices; those practices can generate new political coalitions; the coalitions can reshape subsequent law. In such cases, scale is part of the mechanism because causal influence circulates among levels rather than traveling in one direction.

Cross-scale effects also create attribution difficulties. When value or harm propagates across several levels, assigning the outcome to the initial actor alone can overstate individual contribution, while attributing it only to structure can erase situated agency. GRE therefore treats generative attribution as potentially distributed. The relevant task is to identify the relations through which capacities or constraints were

produced and the points at which different actors or structures materially altered the trajectory.

Measurement should reflect this distributed character. Data collected at one scale can miss effects at another. Firm-level productivity data may not reveal household care burdens; household income data may not reveal ecological depletion; national statistics may not capture transnational tax shifting; platform-level engagement metrics may not capture community-level cultural effects. Multi-level designs, linked data, comparative cases, qualitative tracing, and simulation can each contribute where appropriate, provided the relation between evidence and claim remains explicit.

Cross-scale analysis finally has a governance implication. Interventions aimed at one level can generate consequences elsewhere, so institutional responsibility may need to follow generative reach rather than administrative jurisdiction alone. This does not imply unlimited responsibility for every remote consequence. It creates a research question about which downstream effects are sufficiently connected, foreseeable, material, or governable to enter evaluation and design.

The architecture established in this section therefore gives GRE a way to specify where an inquiry begins, how far its analytical boundary extends, and when movement among scales becomes necessary. Individual, organizational, collective, institutional, ecological, and transnational levels are recurrent sites of inquiry rather than a closed hierarchy. Entityhood remains relative to analytical scale, and generative effects can propagate upward, downward, horizontally, and across time. With these levels clarified, the next task is to state the characteristic questions through which a GRE inquiry can interrogate a concrete economic situation.

3.6 Illustrative Questions in Generative Relational Economics

The preceding sections have specified the disciplinary identity, problem-space, methodological primitives, objects, and scales of Generative Relational Economics. Those elements define a field of possible inquiry, but they remain abstract until translated into questions that can organize empirical, historical, formal, interpretive, and normative research. The role of this section is therefore illustrative. It identifies recurrent question-forms that make the distinctive concerns of GRE operational without turning them into a mandatory sequence or a closed checklist. The objective is to show how a researcher can move from a conventional economic problem toward a generative-relational formulation by asking what relations constitute the situation, what is generated through them, how value and capacity travel, where asymmetries are converted into power, and how present arrangements alter later conditions of possibility.

These questions are intentionally broader than particular methods. A question concerning value propagation might be studied through administrative data, interviews, network analysis, accounting records, historical archives, ethnography, simulation, or some combination of these. A question concerning subject formation may require interpretive evidence that differs from the evidence required to identify a re-

source flow. GRE therefore treats the question-form as analytically prior to method selection. Methods are chosen according to the object, scale, mechanism, and evidential problem rather than according to a presumption that one technique defines the field.

The questions are also non-exclusive. A single research project may begin with one and encounter several others. An analysis of a training subsidy may ask who formally receives the subsidy, which household or organizational relations mediate its use, what capacities are generated, how those capacities propagate through employment networks, which forms of value are realized or lost, and whether the programme changes the future bargaining position of workers. The value of the GRE perspective lies partly in making these connections available for investigation while preserving distinctions among them.

The thirteen question families below should consequently be read as an open repertoire. They do not exhaust GRE inquiry, and they do not imply that every project must answer all twelve. Their function is to reveal characteristic directions of attention: constitution, displacement beyond the administrative recipient, generation, propagation, conversion, recirculation, capacity transformation, access to generative capacity and conditions, subject formation, power formation, orientation, foreclosure, and recursive transformation of the conditions of change.

3.6.1 Which Relations Constitute the Economic Situation?

A GRE inquiry can begin by asking which relations make the observed economic situation possible and intelligible. The question directs attention away from treating visible entities as analytically self-sufficient. A worker, firm, household, platform, loan, public service, or market transaction enters an already organized field of legal, infrastructural, contractual, social, technical, ecological, and symbolic relations. Some of these relations are proximate and observable; others operate as background conditions. The task is to identify which of them materially affect the phenomenon under investigation.

This question is selective rather than totalizing. GRE does not require reconstruction of every relation surrounding an object. The relevant relations are those whose inclusion changes explanation, evaluation, or intervention. A study of household energy insecurity, for example, may need to include income, housing quality, tenancy status, energy pricing, family composition, climate exposure, and access to public support. The entire history of the household is unnecessary unless some part of that history affects the mechanism under study. Relational analysis becomes useful when it improves the adequacy of the inquiry rather than when it simply multiplies context.

The question also encourages distinctions among kinds of relation. A legal relation of entitlement differs from an interpersonal relation of trust; a supply relation differs from an ownership relation; a technical dependency differs from a political authorization; an ecological dependency differs from a contractual obligation. Several may intersect in one case without being reducible to one another. Mapping constitution therefore requires enough conceptual resolution to preserve the mechanism carried by each relation.

Relational constitution can also be asymmetric. One party may depend on another

without reciprocal dependence of the same magnitude or kind. A small supplier can depend heavily on a dominant buyer whose dependence on that supplier is negligible. A migrant worker can depend on an employer for income, legal sponsorship, housing, or information. A municipality can depend on a private platform for an infrastructure it does not control. Asking which relations constitute the situation therefore prepares later analysis of bargaining position, exit, capture, and power.

The practical result is a boundary decision. Once the constitutive relations have been identified, the researcher can justify why some actors, institutions, infrastructures, temporal histories, or ecological conditions are inside the analytical frame and others remain outside it. The boundary remains revisable as evidence accumulates. GRE thus treats relational mapping as a disciplined way to construct the object of inquiry rather than as a demand for unlimited contextual description.

3.6.2 What Changes beyond the Administrative Recipient?

Economic programmes and transactions are frequently recorded through an administrative recipient: the person receiving a transfer, the firm receiving a subsidy, the borrower named on a loan, the patient receiving a service, or the organization holding a grant. GRE asks what changes beyond that formally designated unit. The question matters because economic effects often propagate through relations that administrative data do not treat as recipients.

A cash transfer received by one person may alter household consumption, bargaining power, care responsibilities, debt repayment, education, mobility, or support to relatives. A grant to a small firm can affect employees, suppliers, clients, landlords, local tax revenue, or competing firms. A scholarship can transform not only the student's education but household expectations, future remittances, professional networks, and the aspirations of younger family members. The administrative recipient remains an important object, but it does not automatically define the boundary of effect.

This question is not equivalent to measuring conventional spillovers alone. GRE is interested in the relational pathways through which effects move. Two programmes with similar average indirect effects can operate through different mechanisms. One may propagate through knowledge sharing, another through household redistribution, another through changes in bargaining position, and another through infrastructure created for the initial recipient. Identifying the pathway helps distinguish incidental correlation from generated consequence.

The question also exposes burdens that move beyond the recipient. A policy that expands employment for one group can transfer unpaid care to another group. Debt relief for a firm can preserve jobs while imposing losses on pension funds or public budgets. Digital convenience for consumers can shift risk and time costs onto gig workers. The analysis therefore follows both enabling and constraining consequences beyond the administrative unit.

A useful GRE design can make this boundary extension explicit at the outset. The researcher can specify the formal recipient, identify connected subjects and systems likely to be affected, determine which effects are theoretically relevant, and select evidence capable of observing those pathways. The resulting analysis does not reject

administrative categories; it treats them as one layer within a wider relational field.

3.6.3 What Is Generated through an Economic Relation?

A central GRE question asks what an economic relation produces beyond its immediate exchange or recorded output. The relevant generated objects can include income, knowledge, capability, trust, dependency, reputation, infrastructure, organizational routine, institutional legitimacy, ecological burden, expectations, data, symbolic standing, or new relations. Generation concerns the production of later conditions and possibilities, not merely the transfer of an already existing object from one holder to another.

Consider employment. A wage relation transfers income in exchange for labor, but it can also generate skill, professional identity, social networks, credentials, routines, health effects, dependence, bargaining experience, or exclusion from alternative opportunities. Which of these effects matters depends on the research question. A GRE analysis does not assume that every employment relation generates the same bundle. It asks which outputs are produced in this case, through which mechanisms, for whom, and with what temporal persistence.

The distinction between output and generation is especially useful where the immediate output is easy to measure but longer-term transformation is economically important. A training programme can produce a certificate immediately while generating later confidence, network access, occupational mobility, or employer recognition. A public library can provide books and space while generating study routines, weak ties, civic participation, or access to digital services. An open technical standard can coordinate present interoperability while generating an ecosystem of future complementary production.

Generated effects can be intended or unintended. Organizations can deliberately build capability, loyalty, or infrastructure, while other consequences emerge from repeated interaction without centralized design. Some generated effects become visible only retrospectively. GRE therefore distinguishes the existence of a generated consequence from claims about intention. The question concerns the causal or constitutive production of a later condition, not whether an actor planned that condition.

Generation can also be negative in practical or normative terms. A predatory credit relation may generate debt dependency and reduced future exit options. Repeated precarity may generate risk aversion or the erosion of professional capacity. An extractive production process may generate ecological degradation that constrains later economic activity. The category of generation is therefore descriptive before it is evaluative. Evaluation requires additional criteria concerning whose capacities, values, or futures are affected.

3.6.4 How Does Value Propagate?

Value produced or realized in one relation can travel through a wider configuration. GRE asks how that propagation occurs, which pathways carry it, where it amplifies or decays, and who becomes able to use or capture it. The question begins from the observation that valuable effects rarely remain confined to the site at which they first

appear.

Knowledge provides a clear example. A skill acquired by one worker can improve team performance, be taught to colleagues, contribute to organizational routines, support innovation, or become embodied in a product used elsewhere. Public infrastructure can raise the productivity of many firms and households. Trust accumulated through repeated cooperation can reduce coordination costs for later projects. A scientific result can enable downstream technologies, standards, or educational materials. The original site of value generation and the later sites of value realization can therefore be separated in space, time, and institutional ownership.

Propagation has a topology. Some value moves through direct exchange; some through imitation, learning, standards, networks, public goods, reputation, or price changes. Some pathways require institutional authorization. A professional qualification becomes valuable partly because employers and regulators recognize it. A digital protocol becomes valuable as adoption expands. A neighborhood amenity can propagate into land prices through property markets. Mapping the pathway helps determine whether value is widely distributed, locally concentrated, or captured at a bottleneck.

Propagation can also be blocked. Intellectual-property restrictions, incompatible standards, discriminatory networks, lack of infrastructure, language barriers, licensing rules, organizational secrecy, or geographic isolation can prevent generated value from reaching potential users. A GRE analysis can therefore investigate not only how value travels but which relations determine its transmissibility.

This question does not require that heterogeneous forms of value be collapsed into a common unit. Monetary gains, capability expansion, ecological support, recognition, and relational trust can propagate through different mechanisms and may require different measurements. The analytical task is first to identify the form of value and its pathway. Comparison or aggregation comes later, if the research purpose justifies it.

3.6.5 How Does Value Convert across Forms?

Economic life contains interfaces at which one form of value becomes convertible into another. GRE asks how those conversions occur, which institutions authorize them, whose valuations determine the rate or terms of conversion, and what is lost or created in the process. Conversion is analytically distinct from propagation. Propagation concerns movement of value through a relational configuration; conversion concerns a change in the form through which value is recognized or realized.

Education can be converted into credentials, credentials into employment access, employment into income, income into housing security, and housing security into educational opportunity for another generation. Reputation can become credit access. Cultural attention can become advertising revenue. Publicly produced knowledge can become private intellectual property. Ecological capacity can be converted into commodity production, while financial resources can sometimes be converted into restoration or conservation capacity. Each conversion requires a specific institutional and relational interface.

Conversion interfaces are often sites of asymmetry. Actors differ in their ability to define categories, certify equivalence, set prices, control access, or refuse conversion. A platform may convert user attention into advertising income while users lack a comparable mechanism for realizing the monetary value of their data. A credentialing institution can translate learning into recognized status. A financial system can translate property into collateral and collateral into borrowing capacity, thereby privileging subjects who already possess assets recognizable by that system.

Conversion can be lossy. Meaning, context, ecological complexity, or relational quality can disappear when translated into a scalar metric. Conversely, conversion can create new practical possibilities by making heterogeneous resources interoperable. Monetization can enable exchange across distance; standardized credentials can enable mobility; technical standards can connect previously incompatible systems. GRE therefore treats conversion neither as inherently exploitative nor as inherently beneficial. Its consequences depend on the forms involved, the terms of translation, and the distribution of authority over the interface.

Research can make these interfaces explicit. Instead of asking only how much value exists, it can ask which forms are recognized, which remain invisible, who can perform conversion, what conversion costs arise, who captures the resulting surplus, and whether repeated conversion changes the source form itself. Such questions are especially important when policy seeks to make previously unrecognized value legible to markets or administrative systems.

3.6.6 What Recirculates, Dissipates, or Is Extracted?

Generated resources and value can return to the relations that produced them, spread elsewhere, decay, or be extracted by actors positioned to capture them. GRE therefore asks what recirculates, what dissipates, and what leaves the generative configuration. This question focuses on reproduction through time. A relation can remain productive only if enough of the conditions supporting it are replenished, repaired, or renewed.

Recirculation occurs when generated value or capacity contributes to the maintenance or expansion of the relations that produced it. A cooperative can reinvest surplus in shared infrastructure. A university can use research income to support laboratories and training that enable later research. A community enterprise can return part of its income to local services and networks. Trust generated through successful cooperation can make later cooperation easier. Recirculation can therefore create self-reinforcing dynamics without implying that the resulting configuration is socially desirable.

Dissipation concerns loss through time, friction, obsolescence, leakage, neglect, or ecological degradation. Skills can decay when unused; infrastructure can deteriorate without maintenance; trust can erode; institutional knowledge can disappear through turnover; ecological capacity can be depleted; attention can fragment. Some dissipation is unavoidable, while some reflects institutional choices about maintenance and renewal. An analysis focused only on gross production can miss the cost of replacing dissipated conditions.

Extraction occurs when generated value or capacity is appropriated in ways that

weaken the configuration from which it arises or concentrate its benefits elsewhere. Rent extraction from a local economy, uncompensated appropriation of community knowledge, financial distributions that undermine productive investment, or platform capture of user-generated value can all become candidates for investigation. The concept requires mechanism evidence. The fact that one actor gains more than another does not by itself establish extraction; the analysis must identify the relation through which value is captured and the effect on the generative configuration.

Recirculation, dissipation, and extraction can coexist. A profitable firm can reinvest some surplus, distribute some to workers or suppliers, lose some through depreciation, and transfer some to distant owners. A public programme can generate local capacity while trained workers later migrate. The question is therefore compositional: what proportion or form of generated value follows each pathway, and how do those pathways alter future capability?

3.6.7 How Are Future Capacities Transformed?

GRE places particular emphasis on the transformation of future capacity. An economic arrangement matters not only because of what it produces now but because it changes what subjects and systems can do later. This question links present allocation and relation to the future space of feasible action.

Capacity transformation can occur through learning, infrastructure, health, care, institutional reform, ecological change, debt, technological dependency, network formation, or depletion. A loan can expand productive capacity by financing equipment, while repayment obligations can constrain future cash flow. Employment can build skill and reputation while narrowing alternative career paths. A subsidy can help an industry acquire capabilities that persist after the subsidy ends. Environmental degradation can generate present income while reducing the future productive capacity of an ecosystem.

The temporal profile matters. Some interventions impose immediate costs in order to generate later capacity. Others create immediate gains by drawing down capacities that become scarce only later. A short evaluation window can therefore reverse the apparent ranking of alternatives. GRE does not prescribe one universal horizon, but it requires the horizon to be explicit and adequate to the mechanism claimed.

Capacity is also subject-specific and relational. The same infrastructure can expand the capacity of one group while reducing another's control over land or resources. A technology can increase organizational capacity while deskilling particular workers. A regulatory change can expand consumer choice while increasing compliance burdens for small producers. Asking whose future capacity changes prevents aggregate improvement from automatically standing in for distributed capability.

The question also creates an interface with uncertainty. Future capacities cannot always be observed directly at the time of intervention. Researchers may need intermediate indicators, historical comparison, simulation, qualitative evidence, or repeated observation. GRE therefore treats claims about future generativity as evidentially demanding. The more distant the claimed effect, the more explicit the mechanism and uncertainty should become.

3.6.8 Access to Generative Capacity and Conditions

A further GRE question asks who can enter, mobilize, influence, maintain, and modify the processes through which economic generation occurs. The question is related to allocation but is not exhausted by it. Receiving an output is different from being able to call upon the capacity that produces further outputs, and both are different from participating in the formation of the conditions under which that capacity develops.

The distinction can be organized through three analytical layers. The first concerns generated outcomes: who obtains what has already been produced? The second concerns generative capacity: who can mobilize labor, knowledge, organizations, machines, artificial systems, or institutional capabilities to produce something new? The third concerns generative conditions: who can shape infrastructures, legal permissions, standards, education, data, compute, energy, networks, recognition, and other conditions that make particular forms of generation possible? A GRE project may focus on any one layer, but it should avoid assuming that access at one layer entails access at the others.

Artificial intelligence makes the distinction unusually visible. If increasingly capable artificial systems reduce the need to obtain some goods or services through another person's direct labor, the political-economic problem does not necessarily disappear. It can shift toward access to the artificial generative system and toward control over the conditions under which that system operates and evolves. The relevant research question therefore becomes less exclusively who receives the product and more broadly who can make use of, influence, and participate in the development of generative capacity.

This question opens later analysis of capital, power, exploitation, common infrastructure, and generative autonomy without deciding those issues here. Its role in the present repertoire is diagnostic. It asks whether an observed distribution of outputs conceals a more consequential distribution of capacities and conditions, and whether apparently abundant production remains organized through asymmetrical dependence on access to future generation.

3.6.9 How Are Economic Subjects Generated and Stabilized?

Economic analysis often begins with subjects already defined as workers, consumers, owners, borrowers, firms, entrepreneurs, citizens, beneficiaries, or investors. GRE asks how such positions are generated, recognized, stabilized, and transformed. The question concerns practical economic subjecthood rather than a final theory of personhood.

Subject positions can be produced through legal categories, contracts, organizational roles, technologies, data systems, professional standards, markets, and social expectations. A person becomes a borrower not simply by possessing an individual preference for credit but through eligibility rules, identity documentation, scoring systems, collateral conventions, and lender recognition. A platform worker occupies a subject position shaped by contract classification, algorithmic management, customer ratings, payment infrastructure, and labor regulation. A firm becomes an investable object through legal incorporation, accounting practices, governance ar-

rangements, and financial representation.

Stabilization requires continuity. Roles persist because institutions recognize them, records maintain them, counterparties respond to them, and subjects often organize their own expectations around them. This continuity can enable planning and rights while also producing path dependence. A classification that initially facilitates coordination can later restrict access or define subjects in ways that no longer fit their circumstances.

Economic subjects can also be generated through participation. Repeated saving can produce a recognized credit history; apprenticeship can produce professional identity; membership in a cooperative can develop capacities for collective decision-making; long-term unemployment can alter institutional classification and self-expectation. Subject formation is therefore partly an economic process because access to resources, roles, and relations can reshape practical identity and future action.

The question becomes especially important under technological change. Artificial agents, automated systems, platforms, and hybrid human-machine arrangements can perform functions previously associated with human economic subjects. GRE can ask which dimensions of subjecthood are relevant in each domain: productive agency, control over resources, capacity to enter recognized relations, continuity across time, liability, representation, or normative standing. These dimensions need not coincide, and functional capability does not settle moral or legal status.

3.6.10 How Does Asymmetry Become Economic Power?

Differences in resources, knowledge, capability, network position, or technical capacity are ubiquitous. GRE asks when such asymmetries become economic power. The question prevents a simple equation between difference and domination. Power arises when asymmetry is connected to relations through which one actor can shape another's feasible actions, terms of participation, exposure to risk, access to resources, or future capacities.

A firm with superior technology does not automatically hold power over every other actor. Power emerges when that capability is linked to ownership, market position, contractual authority, infrastructure control, legal privilege, dependency, standard-setting, or capture of a bottleneck. Likewise, information asymmetry becomes power when one party can use informational advantage to determine terms, classify others, restrict alternatives, or impose costs that the other party cannot readily avoid.

Exit and dependence are therefore central. A relation can be formally voluntary while one side faces much higher exit costs. Workers may be able to leave an employer in principle but lose legal sponsorship, health insurance, housing, or accumulated benefits. Users may be free to leave a platform but face network effects, data lock-in, or loss of professional visibility. Suppliers may be free to reject a dominant buyer while lacking alternative markets. Power analysis asks how these relational conditions transform nominal options into practical constraints.

Power can also be infrastructural and impersonal. No single actor may intention-

ally dominate others, yet standards, algorithms, payment systems, zoning rules, or inherited property structures can distribute capacities asymmetrically. GRE can therefore examine power embedded in relational architectures as well as direct command. Identifying power does not require attributing malicious intention; it requires showing how a configuration systematically shapes the options or capacities of differently positioned subjects.

The question naturally leads to generative consequences. Power can reproduce itself by generating the resources, information, legitimacy, or dependency that sustain the original asymmetry. It can also erode its own conditions when extraction undermines cooperation or when concentrated authority produces institutional resistance. GRE therefore studies power not only as a present relation but as a potentially self-reinforcing or self-transforming generative configuration.

3.6.11 What Orients the Direction of Generation?

Generation has direction because economic systems selectively develop some possibilities while leaving others unrealized. GRE asks what orients that selection. Markets, institutions, professional communities, public policy, cultural expectations, metrics, aesthetic judgments, scientific questions, organizational goals, and individual aspirations can all influence which objects receive attention and investment.

The question is broader than incentive analysis while remaining compatible with it. Prices and expected returns orient activity, but so do legal mandates, research agendas, rankings, reputational systems, narratives of desirable futures, and perceptions of what is interesting or feasible. A research organization can direct resources toward questions regarded as scientifically significant even when immediate commercial returns are uncertain. A city can prioritize mobility, housing, tourism, or environmental restoration according to institutional and political judgments that structure later investment.

Orientation can operate before explicit choice by shaping salience. Subjects do not evaluate every imaginable possibility. They encounter a selected field of options made visible by institutions, technologies, language, education, and social experience. Recommendation systems, professional curricula, funding categories, procurement rules, and media attention can influence which possibilities become thinkable or practically available. GRE can therefore study the production of the option field as well as selection within it.

Orientation is also heterogeneous. Different subjects can pursue incompatible forms of value or imagine different desirable futures. Economic coordination then involves negotiation, conflict, coexistence, or institutional procedures for selecting among directions. The presence of plural orientations means that generativity alone cannot supply a normative criterion. A system can be highly generative while producing futures that some affected subjects reject.

Research on orientation can ask who participates in defining goals, which signals are amplified, which possibilities are rendered invisible, what feedback modifies priorities, and how orientation changes after new capacities or knowledge emerge. These questions prepare the more systematic treatment of orientation later in Chapter 3 while showing why the direction of generation is already an economic question.

3.6.12 Under What Conditions Does Generation Produce Foreclosure?

Generation can expand future possibility, but it can also close alternatives. GRE therefore asks under what conditions the production of one pathway forecloses others. Foreclosure can arise through irreversible investment, ecological depletion, institutional lock-in, debt, standardization, network effects, path-dependent learning, spatial development, or the concentration of control over key resources.

A technology can create new capabilities while making older infrastructures uneconomic to maintain. An urban development project can generate housing and commercial value while eliminating community uses of land that cannot easily be reconstructed. A standardized platform can enable broad interoperability while reducing space for alternative technical architectures. Specialized education can generate high competence in one domain while increasing the cost of changing fields later. These examples show why generation and foreclosure can occur together.

Foreclosure is not identical to constraint. Every realized choice excludes some alternatives simply because resources and time are finite. The analytical question concerns consequential closure of future possibilities, especially where the closure becomes difficult to reverse or is imposed unevenly across subjects. The degree of reversibility, distribution of exit costs, and availability of alternative pathways therefore become relevant indicators.

Some foreclosure can be justified or desirable. Safety regulation intentionally eliminates dangerous production methods; environmental rules can close destructive extraction pathways; technical standards can reduce costly incompatibility. GRE does not treat openness as an unconditional good. It asks which possibilities are being closed, for whom, by what authority, with what reversibility, and in pursuit of which values.

The question is particularly important for policy evaluation. An intervention can appear successful according to immediate outcomes while narrowing later adaptability. Conversely, a policy that preserves optionality can look inefficient in a short horizon because it maintains redundant capacity or multiple institutional pathways. GRE can therefore include future option structure as part of economic evaluation when the case warrants it.

3.6.13 How Do Relational Structures Transform Their Own Conditions of Change?

The final illustrative question concerns recursive transformation. Economic relations can generate outcomes that alter the mechanisms through which later change occurs. A market can produce firms that reshape regulation; a platform can generate network effects that change entry conditions; a labor arrangement can produce new worker organizations; a financial innovation can change the infrastructure through which future credit is allocated. The object of inquiry is therefore not only change within a structure but change in the conditions that organize subsequent change.

This question requires careful separation among levels of transformation. A system can move from one state to another while its basic rules remain stable. Parameters can change while the form of the mechanism remains intact. Institutions can

revise rules while preserving their authority structure. More strongly, actors, categories, boundaries, or mechanisms can be reconstituted so that the previous model of change no longer describes the later situation adequately. GRE is especially interested in the transition among these cases because historical economic development often involves several simultaneously.

Recursive transformation can be deliberate. Legislators can redesign institutions, firms can alter governance, communities can create new property arrangements, and regulators can modify market rules in response to observed outcomes. It can also emerge without centralized design as repeated practices create new conventions, standards, expectations, or dependencies. In either case, the researcher should identify the pathway through which earlier relations modify later generative conditions.

Reflexivity intensifies the problem. Economic subjects can observe models, policies, forecasts, and classifications and respond to them. A credit score changes behavior because actors know that the score affects access. A policy target can reorganize organizational reporting. A market forecast can affect expectations and transactions. Representation can therefore enter the causal field it describes. GRE treats such reflexive loops as empirically investigable rather than as a reason to abandon formal or causal analysis.

The evidential standard should remain demanding. Claims that a system has transformed its own rules can easily become rhetorical if the relevant rule, boundary, or mechanism is left unspecified. A strong analysis identifies what changed, which earlier relations contributed to that change, how the new arrangement differs operationally from the previous one, and what consequences follow for later possibilities. The concept is useful precisely when it distinguishes ordinary state change from transformation in the organization of change itself.

Taken together, these thirteen question families define a characteristic style of GRE inquiry without establishing a closed doctrine. They invite researchers to move beyond the immediate recipient, transaction, or output when doing so materially improves explanation; to track generation, propagation, conversion, and recirculation across heterogeneous relations; to examine future capacities, access to generative capacity and conditions, subject formation, power, orientation, and foreclosure; and to remain alert to recursive changes in the conditions of change. A project can enter this problem-space through any one of these questions and combine them according to the object and evidence at hand.

The next section converts this repertoire of questions into a more explicit analytical sequence. It distinguishes allocation, relational mediation, generation, propagation, conversion, recirculation, extraction, structural transformation, and changes in generative conditions. That sequence is not intended as a universal causal chain. Its role is to provide GRE with a reusable perspective for deciding which stages of an economic process require attention in a particular inquiry.

3.7 The Distinctive Analytical Perspective of GRE

The preceding sections have specified the problem-space, primitive structure, admissible objects, scales, and illustrative questions of Generative Relational Economics

(GRE). The role of the present section is to state more explicitly the analytical perspective that organizes those elements into a characteristic mode of economic inquiry. Its objective is to describe a sequence of analytical moves through which an allocation, transaction, policy, institution, or other economic event can be followed beyond its immediate recipient and immediate output into the relations, generated capacities, value pathways, structural changes, and altered conditions of future change that it helps produce. The sequence is presented as a research grammar rather than a universal causal law. A concrete study may enter at any point, omit stages that are irrelevant, distinguish several parallel pathways, or discover feedbacks that make the ordering recursive. The analytical value of the sequence lies in keeping distinct processes that conventional evaluation can easily compress into a single outcome measure.

The perspective begins from allocation because allocation remains a central economic operation. Resources, rights, attention, credit, land, labor, data, infrastructure, authority, and institutional recognition are distributed through decisions and arrangements that place something somewhere under particular terms. GRE treats that placement as an initial intervention into a relational configuration. The allocation changes access, bargaining positions, expectations, dependencies, opportunities for coordination, and sometimes the identities or capacities of the participants. Those changes can generate new resources and forms of value, which may propagate through a wider configuration, convert across forms, recirculate into the relations that produced them, dissipate, or become subject to extraction. Repeated or sufficiently consequential processes can alter institutional and relational structure, transform the conditions that enable future generation, and in some cases change the effective rule through which subsequent transformations occur.

This perspective therefore extends the temporal and relational horizon of economic analysis without prescribing one metric of success. Monetary return, productivity, capability, recognition, ecological capacity, knowledge, trust, security, autonomy, and other forms of value can remain heterogeneous. GRE asks how they are generated and connected before deciding whether comparison, aggregation, or normative judgment is warranted. It also keeps mechanism claims separate from moral evaluation. A self-reinforcing process can be economically powerful while normatively objectionable; a process that dissipates one form of value can generate another; a structural transformation can expand some future possibilities while foreclosing others. The following subsections develop the ten analytical moments in this perspective.

3.7.1 Allocation as an Initial Intervention

Allocation is the analytical point of departure because many economic processes become administratively visible at the moment when a resource, entitlement, burden, opportunity, or authority is assigned. Public budgets allocate funds to programmes. Firms allocate capital and labor. Banks allocate credit. Households allocate time and care. Platforms allocate visibility. Legal institutions allocate rights and liabilities. Educational institutions allocate credentials and access. These operations remain central to GRE, yet GRE reads them as interventions into already structured relations

rather than as terminal distributions among self-contained recipients.

An allocation changes more than possession. Receiving credit can alter a firm's bargaining position with suppliers, its ability to hire, its exposure to debt service, and the confidence of other financiers. A housing subsidy can change household security, neighborhood demand, landlord expectations, and local land values. Allocation of research funding can change laboratory composition, collaboration networks, training capacity, and the future distribution of expertise. Even an apparently simple transfer enters a field of existing institutions, expectations, power relations, and conversion mechanisms.

The analytical unit is therefore the allocation-in-context. A useful GRE study specifies what is allocated, under which institutional conditions, to whom or to which configuration, at what time, with what duration, and through which rights or obligations. It also identifies the baseline relations into which the allocation enters. These relations determine what the allocation can become. The same monetary amount can have different generative effects when recipients possess different infrastructure, debt burdens, social recognition, legal status, network access, or ecological conditions.

Allocation can also concern non-scarce or symbolically abundant objects. Attention, rankings, reputational signals, software, information, and institutional recognition can be allocated through procedures that differ from the allocation of rival material goods. Their economic significance often arises from the relations that make them consequential. A search ranking matters because users, advertisers, platforms, and firms respond to it. A credential matters because institutions recognize it. A dataset matters because actors possess complementary computational and organizational capacities. GRE therefore treats allocation as a broad intervention category whose meaning depends on the relational conditions of use.

Starting from allocation preserves continuity with established economic analysis while widening the subsequent inquiry. The initial question remains who receives what, under which conditions. GRE then asks what relations are activated or reconfigured by that placement, what becomes possible because of it, and which downstream effects remain outside the administrative boundary of the allocation itself.

3.7.2 Relational Mediation

An allocation acquires practical significance through relational mediation. Resources rarely produce identical effects independently of the relations through which subjects can use, interpret, exchange, protect, combine, or transform them. Relational mediation names the set of pathways through which an initial intervention becomes economically operative. These pathways can include contractual relations, kinship and care relations, organizational routines, infrastructures, legal recognition, technical standards, reputational systems, financial arrangements, ecological dependencies, and informal networks of trust or exclusion.

Mediation can enable use. A loan becomes productive when a borrower can purchase equipment, hire workers, obtain permits, reach customers, and sustain repayment. A public dataset becomes generative when users have the skills, computational infrastructure, legal permission, and institutional incentives required to employ it.

A school meal programme can affect educational participation through household budgets, health, attendance routines, and parental expectations. The intervention therefore passes through a configuration of relations whose structure conditions the realized effect.

Mediation can also redirect or neutralize an intervention. A subsidy intended for tenants can be partly captured through rent increases. A wage increase can produce limited household security when debt obligations absorb the gain. New infrastructure can intensify land speculation and displace the population whose mobility it was intended to improve. These outcomes do not imply that the allocation itself is analytically irrelevant. They show that its effect is co-produced by the relations through which it travels.

GRE therefore distinguishes administrative recipient from relational incidence. The person or organization named in a programme may be only one node in a larger set of affected relations. Suppliers, creditors, family members, competitors, property owners, workers, public institutions, ecosystems, or future participants can experience consequential effects. The boundary of relevant incidence should follow the mechanism under investigation rather than the accounting category alone.

Relational mediation also includes interpretation. Economic subjects respond to signals through historically and institutionally formed meanings. A tax incentive can be interpreted as temporary or durable. A guarantee can change perceived risk. A government purchase can signal future market demand. A platform rule can alter expectations about visibility and participation. Such interpretive mediation affects behavior without requiring that every actor hold the same belief.

The analytical task is to identify which relations materially condition the pathway from intervention to effect. GRE does not require exhaustive mapping of an entire social world. It requires enough relational specification to explain why the intervention produced the observed or anticipated consequences and why those consequences differ across subjects, sites, or periods.

3.7.3 Generation

Relational mediation can produce new capacities, resources, meanings, institutions, practices, identities, expectations, and forms of value. GRE uses *generation* for this productive moment. Generation concerns the emergence or augmentation of economically relevant possibilities through a relation or configuration. The generated object may be material, symbolic, institutional, ecological, epistemic, or relational. Its significance lies in the fact that later action becomes possible, easier, harder, or differently organized because the configuration has changed.

Production and generation overlap in many cases, yet their analytical emphases differ. Production commonly directs attention toward an output: goods, services, income, knowledge, or measurable performance. Generative analysis asks what further capacities and conditions are created in producing, using, distributing, or maintaining those outputs. A training programme produces instruction and credentials; it can also generate professional networks, self-confidence, recognized status, organizational routines, and future learning capacity. A transport project produces mobility services; it can generate new patterns of settlement, commercial access, land valua-

tion, and ecological pressure. A cooperative produces goods or services while potentially generating shared governance capability and durable norms of reciprocity.

Generation can occur without an intended designer. Repeated market exchange can generate conventions. Repeated platform participation can generate data and reputational histories. Shared exposure to risk can generate mutual-aid institutions. Competitive pressure can generate organizational routines or technological standards. Conversely, deliberate interventions can fail to generate the capacities they target because the necessary relational conditions are absent.

Generated outcomes are frequently distributed unevenly. A technology can generate organizational productivity while reducing the bargaining power or skill development of particular workers. A financial instrument can generate liquidity for one group while creating systemic exposure elsewhere. Public infrastructure can generate collective access while simultaneously generating private land rents. The generative question therefore includes the location and distribution of newly created capacities and constraints.

A GRE analysis should identify the mechanism through which generation occurs. The presence of a later capacity after an intervention does not establish that the intervention generated it. Competing pathways, background trends, selection effects, and independent causes remain relevant. Historical, qualitative, quantitative, comparative, causal, formal, and computational methods can each contribute depending on the problem. Generative language becomes analytically useful when it sharpens mechanism and temporal structure rather than merely redescribing change.

Generation also includes the production of constraints. Debt can generate purchasing capacity and repayment obligations. Digital infrastructure can generate access and dependency. Standardization can generate interoperability and exclusion of incompatible practices. Institutional recognition can generate rights and categories that narrow alternative forms of identity. GRE therefore treats generativity as directionally open: what is generated may expand, stabilize, redirect, or constrain future possibility.

3.7.4 Propagation

Generated effects can move beyond the relations in which they first appear. Propagation concerns the transmission, diffusion, amplification, attenuation, or replication of resources, capacities, constraints, meanings, and forms of value through a wider relational configuration. It extends the analysis from local generation to the pathways through which generated effects become consequential elsewhere.

Propagation can occur through exchange, learning, imitation, network contact, infrastructure, standards, prices, legal precedent, organizational replication, migration, ecological flows, media, or technical interoperability. A skill acquired within one workplace may spread through labor mobility. A protocol developed by one organization may become an industry standard. A reputation produced in one network may affect credit access in another. An innovation can diffuse through suppliers and competitors. Pollution can propagate across ecological and jurisdictional boundaries.

The structure of the pathway matters. Dense networks can accelerate some forms

of diffusion while creating redundancy. Centralized networks can enable rapid dissemination while producing bottlenecks or concentrated control. Institutional filters can privilege particular carriers and suppress others. Spatial distance can be reduced by digital infrastructure for information while remaining decisive for housing, care, logistics, or ecological impact. A GRE account therefore asks through which relations the effect propagates and how topology, access, and institutional authority condition that movement.

Propagation is also selective. An intervention that generates knowledge may propagate technical information more easily than tacit practice. Monetary gains may cross organizational boundaries through payments while trust remains locally embedded. Recognition can travel across institutions only when credentials or reputational signals are mutually accepted. Ecological damage can propagate physically even when financial liability does not. The form of what moves and the medium through which it moves should therefore be distinguished.

Amplification and attenuation are important possibilities. A small innovation can become economically large when network effects, complementary investment, or standardization amplify adoption. A substantial local intervention can dissipate as effects pass through weak or incompatible connections. The magnitude observed at the origin gives limited information about the magnitude realized elsewhere.

GRE also considers the distribution of access to propagation pathways. Actors positioned at interfaces, platforms, logistics hubs, standards bodies, financial intermediaries, or institutional gateways can influence what travels and under which terms. Propagation can therefore become a source of power as well as a mechanism of diffusion. The relevant inquiry concerns the relational architecture through which generated effects acquire reach.

3.7.5 Conversion

Propagation frequently encounters interfaces at which one form of resource or value is translated into another. Conversion concerns these transformations among forms. Income can become education, housing security, political access, or health. Knowledge can become credentials, intellectual property, technical standards, or market advantage. Attention can become advertising revenue. Reputation can become creditworthiness. Land can become collateral. Ecological capacity can become commodity output, while financial resources can sometimes become restoration capacity.

Conversion differs from movement within a single form. A payment transferred between accounts remains monetary propagation. A credential used to obtain employment converts recognized educational achievement into labor-market access. A public research result licensed into proprietary technology passes through an institutional conversion interface that changes the rights and forms through which its value can be realized. The distinction helps identify where commensuration, authorization, pricing, certification, or institutional recognition becomes necessary.

Conversion interfaces are rarely neutral. Actors differ in their ability to define categories, establish equivalence, set prices, issue credentials, certify quality, recognize claims, or deny access. A bank decides which assets count as acceptable collateral. A university determines which learning qualifies for a degree. A platform determines

which forms of attention can be monetized and by whom. A legal system determines which interests can become enforceable rights. Control over conversion can therefore become a source of economic power.

Conversions can be partial or lossy. Rich forms of knowledge can be reduced to a credential or score. Ecological complexity can be translated into a carbon metric. Care can be monetized without preserving every relational quality attached to unpaid care. Standardization may sacrifice contextual detail while enabling interoperability across institutions. GRE therefore keeps the source form and converted form analytically distinguishable and asks what information, capacity, meaning, or control is gained or lost in translation.

Conversion can also generate additional value. A technical standard can make separate systems interoperable. A recognized qualification can enable geographic mobility. Monetization can permit resources to be exchanged across otherwise disconnected contexts. Legal incorporation can allow a collective project to contract, borrow, or hold assets. The normative significance of conversion depends on the terms, distribution, reversibility, and consequences of the transformation rather than on conversion as such.

Because heterogeneous values may resist full commensuration, GRE does not assume a universal conversion metric. Some forms may be partially convertible, institutionally incomparable, or normatively protected from exchange. The analytical task is to identify the interface, the actors who govern it, the terms under which conversion occurs, and the effects of repeated conversion on both the source and destination forms.

3.7.6 Recirculation

Generated and converted value can return to the relations and capacities that helped produce it. Recirculation concerns this return and the possibility that an economic configuration reproduces or expands its own generative conditions through the value it creates. Recirculation provides a bridge from one-time effects to recurrent economic dynamics.

A firm may reinvest earnings in productive equipment, worker training, research, or supplier development. A cooperative may return surplus to shared infrastructure. A university may use research income to support laboratories and students who enable later research. A community institution may reinvest revenue in local services and networks. Trust produced through successful collaboration can reduce the cost of subsequent collaboration. In each case, an output contributes to the maintenance or enlargement of a condition that supports later generation.

Recirculation is broader than financial reinvestment. Knowledge can return through teaching and mentorship. Institutional capacity can return through improved procedures. Ecological value can return through restoration. Recognition can return through strengthened membership and participation. Data generated by users can be used to improve a service that then attracts further users. The relevant object is the pathway by which generated value reconnects to a generative configuration.

The rate, distribution, and governance of return matter. An organization can generate large value while returning little to the workers, communities, infrastructures, or ecosystems that sustain it. Another can deliberately allocate returns to maintain those conditions. The existence of some recirculation does not by itself establish sufficiency or justice. A system can remain self-reinforcing while distributing benefits unequally or depleting unmeasured conditions outside its accounting boundary.

Recirculation can create positive feedback. Additional capability increases later generation, which supplies further resources for capability formation. Such loops can support cumulative development, institutional persistence, or technological lock-in. Their effects depend on the underlying configuration. A virtuous cycle for one group can become an exclusionary barrier for another when access to the loop is restricted. Self-reinforcement is therefore a dynamical property to be analyzed separately from normative desirability.

GRE uses recirculation to ask whether generated value contributes to the reproduction of the capacities and relations on which future generation depends. This question is especially important where conventional accounts register output or profit while leaving maintenance, care, learning, ecological renewal, and institutional reproduction analytically peripheral.

3.7.7 Dissipation and Extraction

Generated value does not necessarily return to its generative configuration. Some of it dissipates through depreciation, obsolescence, friction, neglect, entropy, institutional turnover, loss of trust, or ecological degradation. Some is extracted by actors positioned to appropriate value without proportionately sustaining the conditions from which it arises. GRE treats dissipation and extraction as distinct pathways because their mechanisms and policy implications differ.

Dissipation can occur without an appropriating beneficiary. Infrastructure decays when maintenance is deferred. Skills weaken when unused. Organizational memory disappears through turnover. Trust erodes after repeated coordination failures. Ecological capacity can decline through cumulative pressure. Data lose relevance. Knowledge becomes obsolete. These processes imply that the maintenance of a generative configuration often requires recurrent inputs rather than a one-time investment.

Extraction involves a relational mechanism of capture. Rent can be appropriated because ownership or control over a bottleneck allows an actor to claim part of the value generated elsewhere. A platform can capture value from user activity through control of infrastructure and monetization interfaces. A financial arrangement can transfer returns away from productive reinvestment. A firm can rely on public education, care work, or ecological capacity while externalizing part of the cost of reproducing those conditions. The analytical claim requires evidence of the pathway through which value is captured and of its relation to the generative configuration.

Unequal distribution alone does not establish extraction. A participant can receive a large return because it supplies scarce capital, bears risk, contributes specialized knowledge, or performs coordination. GRE therefore asks what relation supports the claim, what alternative arrangements are feasible, whether the captured value weak-

ens or sustains the source configuration, and how bargaining power and institutional rights shape the terms of appropriation.

Dissipation and extraction can interact. Deferred maintenance can make an organization dependent on external financing, which can increase opportunities for future extraction. Extractive arrangements can reduce resources available for training or ecological renewal, accelerating dissipation. Conversely, some forms of external appropriation can finance infrastructure that improves the source configuration. Mechanism and temporal sequence matter more than categorical labeling.

The analytical purpose is to account for where generated value goes. A process that appears productive at one accounting boundary may look fragile once maintenance requirements, externalized costs, and captured returns are traced over time. This wider accounting remains plural: GRE need not translate every dissipated or extracted form into money in order to analyze its economic significance.

3.7.8 Structural Transformation

Repeated allocations, mediations, generation, propagation, conversion, recirculation, dissipation, and extraction can alter the relational structure within which later economic action occurs. Structural transformation concerns changes in relatively persistent configurations of access, authority, dependency, coordination, classification, ownership, infrastructure, and institutional recognition. The analytical horizon therefore moves from flows through a structure to changes in the structure itself.

A credit programme can gradually create new financial histories that alter who is considered bankable. Platform adoption can reorganize market access and bargaining relationships. Public infrastructure can change settlement patterns and land values. Repeated outsourcing can transform organizational boundaries and labor relations. An educational expansion can change occupational competition and credential requirements. Long-term extraction can concentrate ownership sufficiently to reshape political and market power. These effects persist because the relations through which later actors operate have changed.

Structural transformation can be cumulative. Small changes in network access, standards, expectations, or institutional categories may become mutually reinforcing. Once a technical standard reaches broad adoption, complementary investments increase switching costs. Once a legal category becomes embedded in administrative systems, data structures, and organizational routines, later decisions may reproduce it. Such persistence does not imply irreversibility, yet reversal can require interventions different in kind from those that produced the initial change.

Structure is scale-relative. A transformation that appears structural for a household may be local from the perspective of a national economy. A regulatory change can be structural for an industry while leaving broader institutional arrangements intact. GRE therefore specifies the scale and boundary at which structural transformation is claimed. The term should signal a change in the organization of relations relevant to the inquiry rather than function as a synonym for any large effect.

Structural transformation can redistribute generative capacity. New infrastructure can enable some actors to participate while making others dependent on cen-

tralized systems. Consolidation can create investment capacity and reduce diversity of organizational forms. A new property regime can make resources legible and tradable while displacing customary claims. GRE asks how the changed structure reorganizes the possibilities available to different subjects and which later pathways become easier, harder, visible, or inaccessible.

At this stage, the analytical perspective begins to become recursive. Structures mediate later allocations and generation, while those processes can further transform structure. The economy is therefore approached as historically layered: present relations carry residues of earlier allocations, conversions, institutions, conflicts, and generative cycles.

3.7.9 Transformation of Generative Conditions

Structural change becomes especially significant when it alters the conditions that make later generation possible. Generative conditions include capacities, infrastructures, ecological resources, legal permissions, institutional trust, knowledge bases, standards, networks, interpretive categories, and other background arrangements through which new economic possibilities can emerge. Transformation of generative conditions concerns changes in this enabling and constraining environment.

The distinction between generated output and generative condition is temporal and relational. A research project can produce a paper as an output while training researchers who become a condition for later inquiry. A transportation system can provide current mobility while also changing the accessibility structure through which future firms and households choose locations. A legal reform can resolve a present dispute while changing the institutional expectations that shape later contracting. Restoration can generate present employment and rebuild ecological capacity that supports future livelihoods.

Conditions can become more or less diverse. An economy can accumulate specialized capabilities that deepen productive potential within one technological trajectory while reducing adaptability to alternative trajectories. Standardization can create broad interoperability while narrowing variation. Concentrated infrastructure can generate scale economies while increasing dependency on a small number of providers. GRE therefore examines the composition of generative capacity, including redundancy, diversity, reversibility, and dependence.

Generative conditions are distributed. The capacity to innovate may depend on public education, care systems, research institutions, finance, standards, migration regimes, energy infrastructure, social trust, and ecological stability. No single actor needs to own these conditions for them to shape economic possibility. This distributed character makes attribution and governance difficult: benefits may be privatized while maintenance costs remain collective, or collective institutions may fail to recognize contributions occurring outside formal accounting systems.

Changes in generative conditions can also alter who counts as an economic subject. Digital identity systems can enable participation for some subjects and exclude others. New organizational forms can recognize collective actors. Artificial systems can acquire delegated decision capacities that change the distribution of agency in markets and institutions. Educational and technical infrastructures can transform

the capacities through which persons become able to participate in particular forms of production or exchange. These questions prepare the more focused treatment of economic subjecthood in the following section, while the present subsection keeps attention on the background conditions through which such subject positions become possible.

The GRE perspective therefore evaluates interventions partly by their effects on future generativity. Immediate welfare or output remains important, yet an intervention can also be assessed by whether it expands, concentrates, diversifies, depletes, or forecloses the conditions from which later value and action can emerge. Such evaluation requires an explicit temporal horizon and awareness that future uses cannot be fully specified in advance.

3.7.10 Transformation of the Effective Rule of Change

The deepest analytical extension concerns situations in which economic processes transform the effective rule through which subsequent change occurs. A structural configuration can change while the basic mechanisms governing adjustment remain similar. In other cases, the mechanisms themselves are reorganized: new institutions redefine permissible transactions, technologies create new categories of action, collective learning changes how actors respond, platforms redesign market matching, legal reforms alter rights and enforcement, or artificial systems introduce new forms of automated selection and adaptation. GRE treats such cases as transformations of the effective rule of change.

The phrase *effective rule* is deliberately modest. It does not imply that an economy possesses one literal master equation. It refers to the locally relevant mechanisms, institutional procedures, response functions, selection environments, and constraints through which changes in the studied configuration are produced. Different methods can represent these rules differently. A historian may reconstruct them through institutional sequences, an economist through behavioral or equilibrium relations, a network analyst through evolving topology, an ethnographer through changing practices, and a computational model through explicit update procedures.

Rule transformation occurs when later dynamics cannot be adequately described by holding those mechanisms fixed. A market governed by bilateral bargaining can become a platform-mediated market in which ranking algorithms and platform rules shape matching and price formation. A monetary system can acquire new instruments that change transmission mechanisms. A labor process can move from human supervision to algorithmic allocation, altering how performance is measured and how workers adapt. A regulatory reform can change the criteria through which organizations become eligible, compliant, or sanctionable. The later system is connected historically to the earlier one while operating through modified mechanisms.

Rule transformation is especially important under reflexivity. Economic subjects learn, anticipate policies, reinterpret categories, and adapt to models used to govern them. Institutions respond to observed behavior. Firms redesign strategies when competitors imitate them. Regulators revise rules when existing rules generate unintended effects. The object of analysis can therefore react to the representations and interventions applied to it. A stable rule may remain a useful local approximation, yet

GRE keeps open the possibility that repeated interaction changes the mechanisms on which the approximation depended.

The transformation of effective rules also raises a governance problem. Interventions can influence more than outcomes within a given system; they can shape the procedures through which future outcomes will be produced. A procurement rule can determine which organizational forms survive long enough to compete later. A data standard can define what becomes measurable and therefore governable. Intellectual-property rules can influence the future distribution of innovation incentives and knowledge access. Educational assessment can alter what institutions teach and what learners treat as valuable. These interventions operate partly at the level of the future change process itself.

This final analytical moment does not make every economic change a case of rule transformation. The claim requires evidence that the mechanisms generating later transitions have materially changed. Maintaining this threshold preserves the distinction among movement within a structure, transformation of structure, transformation of generative conditions, and transformation of the effective rule of change.

Taken together, the ten moments of the GRE perspective provide a layered way to follow economic action through time and relation. Allocation identifies an initial placement of resources, rights, burdens, or attention. Relational mediation specifies the configuration through which that placement becomes operative. Generation identifies newly produced capacities, constraints, values, subjects, or possibilities. Propagation follows their movement; conversion follows changes of form; recirculation follows return to generative configurations; dissipation and extraction account for loss and capture. Structural transformation asks how persistent relations are reorganized. Transformation of generative conditions asks how the capacity for later generation changes. Transformation of the effective rule of change asks whether the mechanisms producing future transitions have themselves been altered.

The sequence remains a heuristic research architecture. Empirical cases can contain loops, branching pathways, simultaneous processes, and multiple scales whose temporal order is only partially recoverable. GRE's distinctive perspective lies in making these layers available for explicit inquiry while preserving the possibility that a narrower established economic analysis may be sufficient for a particular question. The next section turns from this analytical architecture to one of its most consequential objects: the economic subject itself, whose identity, recognition, capacities, and persistence can be treated as historically and relationally generated rather than analytically fixed in advance.

3.8 GRE and the Economic Subject

Generative Relational Economics (GRE) requires a conception of the economic subject that is sufficiently stable for analysis and sufficiently open to account for historical transformation. The role of this section is to specify that conception after the preceding sections have established GRE's objects, scales, problem families, and distinctive analytical sequence. Its objective is to explain how persons, organizations, artificial systems, and other configurations can occupy economically consequential sub-

ject positions without assuming that subjecthood is a timeless property given prior to economic relations. The discussion proceeds through eight connected problems: the movement from given agents to relationally situated subjects; institutional recognition; relational persistence; the coexistence of human and artificial economic subjects; heterogeneity among subjects; capability asymmetry and ontological distinction; participation under conditions in which productive necessity may decline; and subject formation itself as an economic process. The method is constitutive rather than taxonomic. GRE does not attempt to settle the metaphysics of personhood, consciousness, or agency. It specifies a working analytical conception of subjecthood adequate to economic inquiry while preserving ontological suspension and explicit normative separation.

Within this framework, an *economic subject* is a relatively stabilized locus of economically consequential participation that can be identified within a relational configuration. Such participation may include choosing, claiming, producing, consuming, owning, borrowing, contracting, coordinating, representing, interpreting, allocating, governing, bearing risk, receiving recognition, or being made answerable for an economic event. Different forms of subjecthood need not contain the same capacities. A human worker, a household, a corporation, a public agency, and an automated trading system can occupy very different kinds of economic subject position. Their inclusion within a common analytical vocabulary records their participation in economic relations; it does not establish metaphysical, experiential, juridical, or moral equivalence among them.

This distinction is especially important because economic theory often gains tractability by beginning with an already individuated agent. GRE can use such models when the research question warrants them, yet its broader programme keeps open the prior question of how the agent became recognizable, durable, capable, and economically situated. The economic subject can therefore be treated both as a participant in economic dynamics and as a possible product of those dynamics. Wage relations, property regimes, credit systems, organizational membership, legal classifications, technical infrastructures, educational institutions, platforms, and systems of representation can all help constitute which subjects exist for an economic process, what they can do, how they are recognized, and which futures become available to them.

3.8.1 From Given Agent to Relationally Situated Subject

A large class of economic models begins with agents whose identities, preferences, feasible actions, and relevant resources are specified before the modeled interaction begins. This abstraction can be highly productive. It makes possible clear analysis of choice, exchange, strategic interaction, allocation, and equilibrium. GRE retains these analytical resources while adding a complementary question: under which relations did the modeled agent become the kind of subject for whom those preferences, capacities, resources, and feasible actions are available?

The move from a given agent to a relationally situated subject changes the analytical starting point. A worker enters a labor market with skills formed through education, family relations, health, language, migration status, credentialing, and previous

employment. A firm enters a market through legal incorporation, ownership arrangements, financing, supplier relations, infrastructure, standards, and accumulated organizational routines. A consumer appears in a platform economy through accounts, payment systems, identity verification, recommendation systems, device access, and categories through which demand is represented. In each case, the subject remains a meaningful analytical unit, while its capacities and boundaries are understood as relationally conditioned.

Relational situatedness does not imply that a subject is reducible to its relations. GRE requires enough analytical independence to speak about a subject's actions, interests, experiences, holdings, or capabilities when those categories are warranted. The point is that such independence is historically and institutionally achieved to varying degrees. A property owner can act independently with respect to an asset because institutions stabilize ownership claims. A worker can negotiate because labor law, organizational rules, scarce skills, collective representation, or outside options provide a position from which negotiation is possible. A household can plan because some flows of income, care, residence, and obligation persist through time. Subjecthood therefore contains a relation between relative individuation and continuing dependence.

This approach also prevents agency from being treated as a single scalar quantity. A subject may possess substantial agency in one relation and little in another. A highly skilled employee may exercise considerable control over technical decisions while possessing limited bargaining power over employment conditions. A small firm may choose its product design while remaining strongly constrained by a dominant platform or creditor. A government agency may have formal authority but limited informational or implementation capacity. GRE therefore asks which dimensions of agency are operative, through which relations, and at which scale.

Relational situatedness further allows preferences and objectives to be historically formed without assuming that they are infinitely malleable. Education, advertising, professional communities, organizational cultures, social norms, technologies, and repeated interactions can affect what subjects attend to, expect, desire, or regard as feasible. A research programme can study these processes without denying that subjects also exhibit persistence, reflection, resistance, and internally organized commitments. GRE's analytical interest lies in the conditions through which orientation is formed and revised, a problem developed more directly in the following section on the orientation of generation.

The relationally situated subject therefore supplies an intermediate analytical position. It is more structured than an undifferentiated relational field because it permits attribution of action, capacity, burden, and value to relatively stabilized participants. It is more historically open than a permanently given agent because its boundaries, capacities, orientations, and recognized positions can themselves become objects of inquiry. This duality is central to GRE's treatment of subjecthood.

3.8.2 Subjecthood and Institutional Recognition

Economic subjecthood depends partly on recognition. Institutions specify who can open an account, hold property, enter a contract, receive a payment, owe a tax, reg-

ister a company, claim a benefit, represent an organization, access a market, or be counted within an administrative category. Recognition converts a potential participant into a legible participant for a particular institutional process. The resulting subject position can carry rights, obligations, expectations, records, and pathways for future action.

Recognition is distributed across institutions rather than concentrated in a single act. Legal systems recognize persons, organizations, property titles, and contractual capacities. Firms recognize employees, managers, vendors, customers, and authorized representatives. Financial institutions recognize account holders, borrowers, guarantors, and beneficial owners through their own procedures. Platforms recognize users, creators, advertisers, sellers, developers, and automated processes through technical accounts and permissions. Public programmes recognize beneficiaries through eligibility categories. Statistical systems recognize populations through classifications that subsequently shape policy and resource allocation.

These forms of recognition need not coincide. A participant can be economically active while remaining weakly represented in administrative data. A person can be recognized by one institution and excluded by another. An organization can exist juridically while possessing limited practical capacity to act. A platform account can exercise extensive economic functions while the relevant legal obligations remain assigned to a human or organizational principal. GRE therefore treats recognition as relation-specific. It asks who or what recognizes the subject, for which purpose, under which criteria, and with which consequences.

Institutional recognition can also generate capacities. Registration can permit access to banking, procurement, insurance, or legal enforcement. A professional credential can authorize entry into a labor market. A credit history can create or restrict borrowing possibilities. A platform reputation can affect visibility and transaction opportunities. Recognition is therefore more than descriptive classification. Under some conditions it becomes a productive resource whose possession changes future possibilities.

The converse process is economically consequential as well. Misrecognition, weak recognition, or exclusion from relevant categories can constrain participation even when material capacity exists. A skill that lacks accepted certification may command less value. Informal work can remain economically important while receiving limited legal protection or statistical visibility. Care activities can sustain productive systems while remaining weakly represented in monetary accounts. GRE can analyze these situations by separating material contribution, institutional recognition, representational visibility, and normative valuation rather than treating them as a single dimension.

Recognition also creates subject positions that may reshape conduct. A person classified as debtor, beneficiary, employee, high-risk customer, eligible applicant, or verified creator encounters a different opportunity structure and may respond to the expectations associated with that position. The category becomes economically generative when it affects access, incentives, treatment by others, or self-understanding. The same mechanism applies to organizations. Classification as a regulated institution, nonprofit entity, startup, contractor, or systemically significant actor can alter available strategies and obligations.

GRE therefore treats institutional recognition as one mechanism through which economic subjecthood becomes stabilized. It remains distinct from ultimate personhood or moral status. Institutional categories can be revised, contested, strategically used, or shown to be inadequate. Their analytical importance lies in the fact that economies operate through such acts of recognition, and those acts participate in generating the subjects that economic analysis subsequently encounters.

3.8.3 Subjecthood and Relational Persistence

Recognition at one moment is insufficient for many economic processes. Credit, employment, ownership, reputation, insurance, investment, planning, responsibility, and cooperation depend on some capacity to identify a subject across time. GRE therefore treats relational persistence as another condition of economic subjecthood. Persistence means that a configuration can remain sufficiently identifiable across a sequence of interactions for expectations, records, obligations, capacities, and value to accumulate around it.

Persistence does not require immutability. A corporation can change employees, owners, strategies, and assets while remaining recognizable as the same juridical organization for relevant purposes. A household can change membership while retaining continuing obligations and resources. A person can change occupation, preferences, health, wealth, and social position while maintaining biographical and institutional continuity. An artificial system can be updated or retrained while an operational identity, account, mandate, or deployment context persists. Subjecthood therefore depends on criteria of continuity that vary by domain.

Different institutions stabilize continuity through different devices. Names, identifiers, contracts, registries, records, credentials, accounts, signatures, organizational charts, audit trails, reputational histories, and technical logs can all support persistence. These devices allow past interactions to influence present treatment. They make possible credit histories, employment records, accumulated reputation, continuing ownership, delegated authority, and accountability. In this sense, memory is partly institutionalized in economic relations.

Persistence has generative consequences because accumulated history changes future opportunities. Trust can deepen through repeated cooperation. Debt can compound. Reputation can open or close markets. Skills can accumulate through practice. Organizational routines can increase coordination capacity. A history of exclusion can constrain later access even when formal rules change. Economic subjecthood therefore has a temporal dimension: the subject is often a carrier of selectively preserved history.

The preservation is always partial. Institutions decide which past events remain legible and which disappear. Credit systems preserve some payment histories while ignoring many contextual circumstances. Employment records preserve formal roles while omitting informal contribution. Platform metrics preserve selected traces of participation. Historical records may be unequally available across groups and organizations. GRE therefore treats persistence as an epistemic and institutional construction as well as a temporal fact. The subject that appears stable to an analyst may be stabilized by selective recording.

Relational persistence can also fail. Organizations dissolve, identities become contested, records disappear, contractual relations end, platforms remove accounts, or political and technological transformations invalidate previous classifications. Such failures can release subjects from prior constraints, erase accumulated value, disrupt responsibility, or create opportunities for reconstitution. Subject dissolution is therefore part of the economic analysis of subjecthood rather than a mere exception to stable identity.

This temporal view enables GRE to analyze subject formation without assuming a permanent core that economic relations simply reveal. A subject can become more or less coherent, legible, capable, autonomous, or constrained through time. The relevant question is which mechanisms sustain continuity, what they preserve, what they suppress, and how persistence alters the subject's future generative possibilities.

3.8.4 Human and Artificial Economic Subjects

The increasing delegation of economically consequential tasks to artificial systems makes the category of economic subject more complex. Software already performs functions such as ranking, pricing, matching, forecasting, bidding, recommending, filtering, scheduling, allocating attention, and executing transactions under specified conditions. More capable artificial systems can also participate in extended sequences of planning, communication, and decision support. GRE requires a vocabulary that can analyze such participation without presuming that functional capability settles questions of consciousness, personhood, moral standing, or legal status.

A useful distinction is between *human subjecthood* and *artificial operational subjecthood*. Human economic subjects are embodied, vulnerable, temporally finite participants whose economic lives are connected to experience, welfare, social membership, care, rights, and material dependence. Artificial operational subjects can occupy functionally stabilized positions in economic processes when systems are authorized, configured, or institutionally treated as loci through which actions are selected and executed. Their economic relevance can be substantial even when ultimate responsibility, ownership, or legal personality remains assigned elsewhere.

Operational subjecthood can arise through delegation. An organization may authorize a software system to execute trades within limits, set prices, route logistics, select advertisements, or communicate with customers. The system then becomes a proximate locus of economically consequential action. The relevant GRE questions concern the relations that enable this delegated position: who defines the objective, who supplies data, who controls deployment, who bears losses, who can override the system, how actions are attributed, and how generated value returns to the surrounding organization.

This approach avoids a binary choice between treating artificial systems as mere passive tools and treating them as equivalents of human persons. The appropriate analytical status can vary with the inquiry. For a study of market microstructure, an automated trading agent may be a meaningful economic subject because its decisions affect prices and counterparties. For a study of moral injury, welfare, or distributive justice, the same system may be better analyzed as infrastructure or delegated mechanism while the human and organizational subjects bearing consequences remain

central. Subject classification is therefore question-relative.

Artificial systems can also become components of hybrid subjects. A professional using advanced decision support may acquire capacities unavailable to either the human or the system considered independently. A firm can reorganize around automated coordination. A scientific team can distribute cognitive work across researchers, instruments, databases, and models. A platform can combine algorithms, human moderators, sellers, and users into an operational configuration. GRE can treat such configurations as composite subjects when the composite exhibits sufficient persistence, coordination, and causal relevance for the local question.

The distribution of agency within hybrid configurations is a separate problem from identifying the composite. Delegation can obscure responsibility when an outcome is attributed to "the algorithm" despite organizational choices concerning data, objectives, thresholds, deployment, monitoring, and recourse. Conversely, attributing every artificial action directly to one human decision-maker can ignore emergent behavior, organizational fragmentation, and the practical autonomy created by scale and speed. GRE therefore encourages mechanism-specific attribution across the relations that produce the action.

The coexistence of human and artificial economic subjects also changes the ecology of capability. Artificial systems can amplify the productive and cognitive capacity of some human or organizational subjects more than others. Access to compute, proprietary data, infrastructure, legal expertise, capital, and distribution can determine who benefits from artificial capability. The economic significance of artificial subjecthood consequently lies not only in what a system can do, but in how its capability is situated within ownership, institutional recognition, delegation, and return structures.

3.8.5 Heterogeneous Subjects

GRE treats heterogeneity among economic subjects as a constitutive feature of inquiry rather than a residual deviation from a representative agent. Subjects can differ in material needs, bodily vulnerability, temporal horizon, information, attention, cognitive style, social recognition, bargaining position, legal status, technological access, organizational scale, ecological dependence, and forms of value they regard as significant. These differences shape both immediate economic behavior and the generative consequences of economic relations.

Heterogeneity matters even when subjects receive formally identical resources. A monetary transfer can have different effects depending on debt, housing security, health, care obligations, local prices, social networks, or access to complementary services. The same information can be useful to one subject and unusable to another because complementary knowledge or infrastructure differs. The same employment opportunity can expand freedom for one person and intensify constraint for another because mobility, care responsibilities, or legal status differ. GRE therefore asks how an intervention interacts with subject-specific and relation-specific conditions.

Heterogeneity also concerns value. Subjects can evaluate the same outcome through different normative, cultural, professional, ecological, or experiential frameworks. A land-use change may appear as increased asset value to one actor, loss of

livelihood to another, ecological degradation to a third, and disruption of cultural continuity to a fourth. Economic analysis can sometimes translate these differences into a common measure for a specific decision. GRE does not assume in advance that every relevant value admits such conversion without remainder.

Subjects also differ in their capacity to make their valuations institutionally consequential. Some can purchase expertise, influence standards, control platforms, set contractual terms, or withdraw resources. Others possess weak bargaining power or limited representational access. Heterogeneity therefore interacts with asymmetry. A plural economy does not merely contain different preferences; it contains differently empowered subjects whose ability to stabilize their preferred classifications, metrics, and conversion rules can vary substantially.

Artificial and organizational subjects add further dimensions of heterogeneity. A corporation can persist for durations and command resources unavailable to an individual. An automated system can process information at a speed and scale that differs from human cognition. A public institution can exercise authority through rules rather than exchange. A household coordinates care and consumption through relations that are only partially contractual. Treating these subjects as analytically identical would conceal the mechanisms through which they act.

GRE's response is methodological pluralism at the level of subject modeling. Some questions can use utility functions, representative agents, or homogeneous populations. Others require types, distributions, networks, institutional categories, narratives, or qualitative reconstruction. The choice should follow the mechanism and scale of interest. Heterogeneity becomes analytically important when differences among subjects alter generation, propagation, conversion, bargaining, recognition, or exposure to risk.

This perspective also protects against interpreting difference as deficiency. A subject whose capacities do not match the requirements of a particular market or institution may still possess substantial capabilities that the institution does not recognize or reward. Economic subjecthood is therefore partly relational to the evaluative and infrastructural environment. The same person or organization can appear highly capable in one configuration and weakly capable in another. GRE analyzes that relational fit rather than converting every difference into a single hierarchy of subject quality.

3.8.6 Capability Asymmetry and Ontological Distinction

Economic subjects can differ enormously in capability. A multinational firm and an individual consumer do not command comparable resources. A state and a household occupy different institutional positions. A specialized artificial system can outperform a human participant on a bounded computational task while lacking many features that organize human economic life. GRE therefore separates capability comparison from ontological classification and from normative status.

Capability is multidimensional. It can concern computation, memory, prediction, physical action, social coordination, capital access, legal authority, mobility, learning, creativity, endurance, attention, bargaining, or the capacity to absorb loss. A subject can be strong on one dimension and weak on another. Aggregate labels such as "more

capable" therefore require explicit specification of the relevant capability domain and the task or environment in which it is measured.

The distinction becomes especially important in human–artificial comparison. Superior performance by an artificial system on prediction, optimization, search, coding, or information processing demonstrates a capability difference in the specified domain. It does not by itself establish equivalence in embodiment, vulnerability, experience, social membership, moral standing, legal personality, or other ontological and normative dimensions. Conversely, inferior productive performance by a human subject does not imply diminished moral status or a weaker claim to social participation. Productive capability and normative worth belong to different analytical registers.

GRE therefore resists deriving subject status directly from productivity. Economies routinely assign value to capacities that are historically contingent: strength in one technological regime, literacy in another, credentialed expertise in another, computational skill in another. Technological change can rapidly alter which capacities command market value. If recognition or participation were tied directly to currently scarce productive capabilities, changes in technology could destabilize subject status in ethically and politically consequential ways. GRE treats that possibility as an object of economic analysis rather than as a normative conclusion supplied by productivity itself.

Capability asymmetry also generates power when it affects the terms under which others can participate. A platform with superior information and scale can shape market access. A creditor with greater liquidity can impose conditions on a constrained borrower. An organization equipped with advanced artificial systems can negotiate, monitor, or produce at a level unavailable to smaller actors. The relevant issue is the conversion of capability difference into durable relational advantage. Not every asymmetry becomes power, and the mechanism of conversion requires specification.

Institutional design can amplify or moderate capability asymmetry. Standards, interoperability, public infrastructure, collective bargaining, competition rules, education, access to compute, liability arrangements, and rights of appeal can change how capability differences affect participation. GRE's interest lies in the resulting generative structure: which subjects gain new capacities, which become dependent, which forms of value are captured, and whether the asymmetry reproduces itself through control over the conditions of future generation.

The separation among capability, ontology, and normativity thus performs several analytical functions. It permits precise comparison where comparison is meaningful. It prevents performance metrics from silently becoming theories of personhood. It allows economic analysis to study artificial subjects without assuming human equivalence. It also preserves a space in which questions of justice, rights, dignity, or welfare can be evaluated through appropriate normative arguments rather than inferred from market productivity.

3.8.7 Subjective Participation beyond Productive Necessity

Technological development raises a further question for the constitution of the economic subject: how is participation organized when a subject's contribution is no longer required for a particular productive task? Automation has long displaced and transformed tasks, while new technologies have also created new occupations, complementary roles, and forms of demand. GRE does not assume a predetermined endpoint of this process. It identifies a structural problem that becomes more visible as productive capability can be supplied by machines or highly concentrated organizations: economic participation and social subjecthood may become less tightly coupled to productive necessity.

Historically, many economic institutions connect income, recognition, schedule, social interaction, insurance, status, training, and future opportunity to employment or productive contribution. When a task disappears, the loss can therefore extend beyond wages. A subject can lose routines, networks, bargaining position, identity, institutional recognition, and pathways for capability development. Analyses that record only the change in output or income can miss this wider transformation of subject position.

GRE uses the idea of *subjective participation* to name participation through which a person or collective can remain an active locus of choice, recognition, relation, contribution, and value formation within economic life. Productive work can be one important form of such participation, but the category is broader. Care, learning, civic contribution, cultural production, scientific inquiry, community activity, consumption, stewardship, and relational maintenance can all organize economically consequential participation even when their market valuation is limited or indirect.

The economic question is therefore partly institutional. If productive necessity declines for some subjects, which mechanisms connect them to resources, capabilities, recognition, and opportunities for meaningful participation? Several institutional arrangements are conceivable, and GRE need not select among them at the level of disciplinary constitution. The research programme can instead examine how different arrangements affect autonomy, dependence, value generation, social recognition, bargaining power, capability development, and the distribution of future possibilities.

This problem also applies within organizations. An employee whose routine tasks are automated can become more capable when artificial tools release time for judgment, learning, care, design, or coordination. The same technological change can instead narrow the employee's role to monitoring a system controlled elsewhere. The distinction depends on ownership, training, discretion, workflow design, evaluation, and bargaining relations. Automation therefore transforms subjecthood through the surrounding institutional field rather than through task substitution alone.

Artificial systems intensify the question because they can participate in economic processes without requiring the same conditions for welfare, livelihood, social membership, or embodied reproduction as human subjects. A production system organized solely around output can therefore allocate increasingly large shares of economically consequential activity to artificial or organizational subjects while human participation becomes administratively residual. Whether and how institutions re-

spond is a normative and political question; the economic analysis concerns the relations through which such a configuration affects value, demand, bargaining, recognition, capability, and social reproduction.

GRE thus separates the right to analyze productive contribution from the broader question of subject participation. It does not assume that economic inclusion must be earned through scarcity of labor, nor does it presume a specific institutional alternative. It asks how systems generate or foreclose forms of participation when technological and organizational change modifies the economic necessity of particular human capacities. The answer will depend on the orientation of generation, the subject of the following section.

3.8.8 Subject Formation as an Economic Process

The preceding subsections imply a final constitutional claim: subject formation is itself an economic process. Economic relations do more than coordinate already formed subjects. They participate in producing the capacities, identities, expectations, dependencies, temporal horizons, and recognized positions through which subjects subsequently act. GRE therefore includes subject formation within its field of inquiry whenever economic mechanisms materially contribute to that formation.

Labor markets provide a clear illustration. Education and credentialing prepare subjects for occupational categories; hiring procedures classify them; employment develops some skills while allowing others to decay; organizational hierarchies distribute authority; compensation affects outside options; performance metrics orient attention; career ladders shape expectations about the future. The resulting worker is neither created wholly by the labor market nor independent of it. Subject formation occurs through the interaction of economic, educational, familial, legal, cultural, technological, and biological processes.

Credit relations can similarly generate debtor subject positions. Access to credit expands purchasing or investment capacity while repayment schedules reorganize future income. Credit histories affect later access. Default categories alter institutional treatment. Financial literacy, risk tolerance, and expectations can change through repeated borrowing. The economic subject that returns to a credit market is therefore historically modified by previous participation.

Platforms generate other subject forms through accounts, metrics, rankings, recommendation systems, monetization rules, and categories of permissible participation. A person can become a seller, creator, driver, host, advertiser, moderator, or rated customer through platform-specific infrastructures. These positions can create capabilities and income while also subjecting participants to new dependencies, forms of visibility, and evaluative systems. Artificial systems can likewise acquire operational subject positions through permissions, interfaces, memory, delegated objectives, and persistent identifiers.

Property institutions contribute to subject formation by stabilizing relations of control, responsibility, inheritance, exclusion, and expectation. Welfare institutions constitute beneficiary categories. Tax systems recognize households, firms, dependents, and taxable events. Corporate law stabilizes organizations that can persist beyond individual members. Monetary institutions constitute account holders and counter-

parties. Economic subjecthood therefore emerges repeatedly through institutional architectures that define who can do what, with which resources, under which records and obligations.

Subject formation also has recursive effects. Once a subject position is stabilized, subjects can act to preserve, reinterpret, contest, or transform the relations that formed them. Workers organize; firms lobby; consumers coordinate; professional groups set standards; communities create institutions; platform participants develop practices that alter platform design. Subject formation is therefore compatible with reflexivity. Generated subjects can become generators of subsequent institutional change.

This recursive structure connects subject analysis to GRE's broader concern with transformation of generative conditions. An economic system can generate subjects whose capacities and orientations reinforce the system. It can also generate subjects capable of questioning, modifying, or leaving it. Educational investment can create workers suited to an existing industrial structure while also producing knowledge that enables new industries. Financial systems can stabilize prevailing ownership while funding innovations that disrupt incumbent firms. Organizational routines can reproduce hierarchy while creating expertise that later supports institutional reform. The direction of subject formation is therefore neither mechanically reproductive nor inherently emancipatory.

For empirical work, treating subject formation as an economic process requires evidence appropriate to the mechanism. Administrative records can reveal changing classifications and access. Longitudinal data can track capability or income trajectories. Organizational records can show role transformation. Interviews and ethnography can recover changes in interpretation, identity, and perceived possibility. Experiments can identify bounded responses to institutional arrangements. Computational methods can trace large-scale patterns of classification or interaction. GRE does not privilege one method; it requires the method to match the dimension of subject formation being claimed.

The economic subject can now be located within the constitutional architecture of Chapter 3. GRE treats subjects as relatively stabilized participants whose capacities, recognition, persistence, and orientations are relationally conditioned and historically transformable. Human, organizational, and artificial subjects can all enter economic analysis while remaining ontologically and normatively distinct. Capability asymmetry can shape power without determining moral status. Participation can remain economically important even when particular productive contributions lose scarcity. Subject formation itself can be generated through economic relations and can recursively transform those relations in return.

This account also identifies the next constitutional problem. If economic relations help generate subjects, capacities, attention, and future possibilities, the direction of that generation cannot be treated as analytically empty. Economic systems select, reward, amplify, suppress, and stabilize different possibilities. Section 76 therefore turns from the constitution of subjects to the orientation of generation: the processes through which attention, curiosity, aesthetic judgment, epistemic priorities, institutional selection, and heterogeneous value structures influence what becomes economically generative.

3.9 GRE and the Orientation of Generation

Generative Relational Economics treats economic generation as more than the production of additional outputs from given inputs. Economic relations can enlarge, redirect, stabilize, or close future possibilities; they can generate capacities, questions, representations, institutions, expectations, forms of value, and modes of participation. Once generation is understood in this wider sense, a further analytical problem becomes unavoidable: generative processes are oriented. Among many possible objects of attention, questions, investments, designs, interpretations, and institutional trajectories, some become salient and others remain peripheral. The role of this section is to make that directional dimension explicit within the constitution of GRE. Its objective is to identify several mechanisms through which orientation is formed and economically consequential without reducing orientation to a single preference ordering or normative criterion. The discussion proceeds through attention and salience, curiosity and question formation, aesthetic judgment, epistemic orientation, institutional selection, and heterogeneous value structures before locating orientation itself as an economic and political problem. The method remains constitutive rather than exhaustive: these mechanisms identify admissible objects of GRE inquiry and can be combined differently across empirical domains.

Orientation occupies a position between possibility and realized generation. A field can contain several technically feasible innovations, several plausible interpretations of evidence, several ways of organizing care, several institutional reforms, or several investments capable of producing future value. Generativity alone does not determine which possibility receives resources, recognition, attention, or continued development. Selection occurs through subjects, organizations, infrastructures, norms, evaluative conventions, histories, and unequal capacities to make one possibility visible or actionable. GRE therefore asks not only what a relation can generate, but how its generative direction becomes selected, reinforced, contested, or revised.

This problem is distinct from saying that every economic process possesses a conscious purpose. Orientation can arise without centralized intention. Search rankings alter attention; funding rules privilege some questions; professional conventions stabilize standards of relevance; prices redirect investment; built environments make some actions easier than others; inherited categories determine what can be recorded; and repeated interaction can make one trajectory increasingly probable. Orientation can therefore be intentional, institutional, distributed, emergent, or mixed. What matters for GRE is the mechanism through which a space of possibilities becomes unevenly weighted and how that weighting changes subsequent generation.

3.9.1 Direction within Generative Processes

Generation becomes analytically directional whenever several possible continuations are available and the realized process favors some over others. A research group can investigate several questions but allocates effort to a subset. A firm can deploy capital across several technologies but selects particular projects. A city can support several mobility arrangements but builds infrastructure that makes some

trajectories easier to reproduce. A household can convert additional income into consumption, education, savings, care, mobility, or debt reduction. In each case, resources enter a relational configuration whose later consequences depend partly on how possibilities are selected.

Direction should be distinguished from destination. A destination specifies an endpoint toward which activity is explicitly organized. Direction can be weaker and more distributed. It can consist in a persistent bias toward particular questions, objects, timescales, values, or forms of recognition even when no actor has specified a final state. An institution that rewards measurable short-term outputs may orient inquiry toward easily countable achievements without formally prohibiting long-horizon research. A credit system can orient firms toward revenue models compatible with repayment schedules without prescribing a specific product. A platform can orient cultural production through visibility metrics even when creators retain formal freedom over content. GRE is interested in these directional effects because they alter the future distribution of generative opportunity.

Orientation should also be distinguished from deterministic selection. A strong directional field can coexist with novelty, resistance, and contingency. Subjects can reinterpret incentives, institutions can be repurposed, and unexpected relations can open alternatives. The analytical claim is therefore probabilistic and structural: some configurations make particular generative pathways easier to enter, sustain, fund, legitimate, or recognize than others. The strength of orientation is an empirical question that can vary across scales and historical periods.

The concept also permits several levels of analysis. At the level of a subject, orientation can concern attention, aspiration, perceived possibility, or evaluative judgment. At the organizational level, it can concern strategy, metrics, hiring, budgeting, and project selection. At the institutional level, it can concern law, professional standards, eligibility rules, and classification systems. At the infrastructural level, it can concern access, interoperability, search, transportation, or computation. At the cultural level, it can concern what appears admirable, credible, urgent, or worth pursuing. These levels can reinforce or conflict with one another.

Direction becomes especially consequential when orientation feeds back into the conditions of future choice. A selected research programme develops specialized instruments and expertise, making adjacent questions easier to investigate. An industry cluster attracts suppliers and workers, increasing the relative feasibility of further investment in the same domain. A classification adopted for administrative convenience can accumulate datasets organized around its categories, making alternative classifications harder to operationalize. What begins as selection among possibilities can therefore become a transformation of the possibility structure itself.

GRE treats this recursive effect as one reason to study orientation separately from immediate allocation. Allocation determines where resources initially go. Orientation concerns the relational processes that make some uses, interpretations, and continuations more likely to become generative. Their interaction can produce path dependence without requiring that the path was planned in advance. Orientation is thus a bridge between local selection and historical transformation.

3.9.2 Attention and Salience

Attention is a scarce and selective condition of economic participation. Subjects, organizations, and institutions encounter more signals, opportunities, demands, and possible actions than they can process with equal intensity. What enters attention can therefore influence what becomes available for evaluation and generation. GRE treats attention not simply as an internal cognitive resource but as relationally organized through environments, interfaces, institutions, social expectations, and distributions of visibility.

Salience is one mechanism through which this organization occurs. An object can become salient because it is perceptually striking, institutionally emphasized, repeatedly measured, socially endorsed, economically rewarded, emotionally charged, or strategically amplified. Salience need not indicate importance in any independent normative or causal sense. A highly visible indicator can dominate decision making while a less visible condition exerts larger long-term effects. Conversely, a previously neglected relation can become salient when a crisis, measurement innovation, public controversy, or new interpretive framework makes it perceptible as an economic problem.

The economic consequences of salience are therefore twofold. First, salience affects allocation of attention in the present. A firm monitors some indicators more closely than others; an investor notices some opportunities; a public agency prioritizes some risks; a consumer sees some products; a researcher encounters some literatures. Second, repeated attention can alter the object itself. Metrics invite optimization, visibility attracts resources, and recognized problems acquire organizations, professions, and infrastructures devoted to them. Attention can consequently become generative rather than merely observational.

Digital mediation intensifies this issue because ranking, recommendation, notification, and search systems actively order visibility. Their orientation effects may arise from commercial objectives, relevance models, engagement metrics, moderation rules, personalization, or technical constraints. The resulting distribution of attention can affect demand, reputation, cultural production, political communication, and the formation of economic subjects. GRE need not assume that a platform fully controls these outcomes. It can instead ask which mechanisms structure exposure, how users respond, and how visibility feeds back into production and value.

Attention also interacts with inequality. Subjects differ in their capacity to command attention and in their ability to protect their own attention from external capture. Advertising budgets, institutional prestige, network centrality, media access, and control over interfaces can increase one actor's capacity to make objects salient to others. At the same time, workers, consumers, citizens, and researchers can face environments saturated with demands on attention. The distribution of attention therefore has both productive and power dimensions.

A GRE analysis should avoid equating attention with endorsement. A subject may attend to an object because it is threatening, unavoidable, controversial, or institutionally mandatory. Nor should measured engagement be treated as a complete representation of attention. Observable clicks, purchases, dwell time, or citations are partial indicators conditioned by the platform or institution through which they are

recorded. The relation between salience, attention, interpretation, and later action requires empirical specification.

Attention becomes a problem of orientation when it changes which possibilities can enter generative processes. What remains persistently unseen may receive neither investment nor institutional articulation. What becomes hyper-salient can attract disproportionate resources and narrow alternative exploration. GRE therefore studies the production and distribution of salience as part of the economic organization of possibility.

3.9.3 Curiosity and Question Formation

Curiosity introduces a different form of orientation. Attention identifies what enters a field of concern; curiosity can transform an encountered difference, anomaly, absence, or possibility into an object of inquiry. This transformation matters economically because new questions can redirect research, entrepreneurial activity, public investment, education, and institutional experimentation before the value of an answer is known.

Question formation is generative in a stronger sense than information acquisition. A subject seeking a known datum operates within a pre-specified problem. A newly formulated question can reorganize the problem-space itself by distinguishing previously conflated phenomena, proposing a new comparison, or making an unrecognized relation investigable. The economic consequences can be substantial. Scientific questions create research programmes; engineering questions motivate design trajectories; policy questions define measurable problems; entrepreneurial questions organize searches for unmet needs or new combinations.

Curiosity should not be romanticized as an unconstrained internal virtue. Opportunities for curiosity are institutionally distributed. Time, income security, educational access, research infrastructure, mentorship, mobility, archival access, computational resources, and tolerance for failure all affect who can pursue uncertain questions. A person may possess strong curiosity while lacking the relational conditions required to sustain inquiry. Conversely, organizations can create protected spaces in which exploratory questions become economically viable despite uncertain short-term returns.

Question formation is also socially mediated. A discipline defines which questions appear legitimate, mature, trivial, or impossible. A market communicates demand signals that make some problems commercially visible. Public institutions define categories of need. Communities preserve practical knowledge that can make different questions salient from those generated in professional research settings. Interdisciplinary contact can expose assumptions that remain invisible within a single field. Curiosity therefore emerges within histories of classification, authority, and encounter.

The economic orientation of curiosity becomes visible in the distribution of exploratory resources. Research grants, venture finance, procurement programmes, universities, laboratories, foundations, public challenges, and organizational slack all influence which uncertain inquiries can be sustained long enough to generate results. These mechanisms differ from ordinary exchange because expected value may be difficult to estimate ex ante. Selection often relies on judgments concerning

plausibility, novelty, promise, social relevance, or strategic fit rather than on known outputs.

GRE can therefore analyze curiosity as a relational capacity with downstream economic effects. It can ask how an environment makes questions possible, how inquiry becomes sustained, how failed questions still generate capabilities or networks, and how exploratory activity alters the future set of feasible projects. It can also examine exclusion: whose questions receive recognition, which experiences become researchable problems, and which uncertainties remain institutionally invisible.

This perspective does not imply that more curiosity is always better. Unbounded exploration can consume resources, produce distraction, or impose risks on others. Some domains require reliability, maintenance, and disciplined exploitation of established knowledge. GRE's task is not to assign curiosity an intrinsic positive value, but to make visible the conditions under which question formation becomes economically generative and the trade-offs through which exploratory orientation is governed.

3.9.4 Aesthetic Judgment

Economic generation often proceeds under incomplete evidence. Researchers choose among conjectures before proof is available. Designers compare forms before market response is known. Investors assess emerging projects with limited histories. Engineers select architectures before every downstream consequence can be calculated. Public institutions imagine futures for which no complete dataset exists. In such settings, judgment frequently includes an aesthetic dimension: a sense that a problem, pattern, design, explanation, or possibility is elegant, coherent, beautiful, compelling, fertile, proportionate, or otherwise worthy of continued attention.

GRE treats aesthetic judgment as a possible orientation mechanism rather than as a universal or infallible faculty. The term refers here to evaluative responses that help rank possibilities when propositional evidence does not fully determine selection. Such judgments can concern mathematical elegance, conceptual simplicity, visual form, narrative coherence, spatial atmosphere, craftsmanship, symbolic resonance, or the perceived fertility of a question. Their content varies across practices and communities.

Aesthetic judgment can become economically consequential because it directs scarce exploratory resources. Scientists choose which problems feel deep or promising. Architects and planners create environments that shape movement and encounter. Consumers attach value to form and atmosphere. Organizations cultivate identities through design. Investors may respond to narrative and presentation alongside formal projections. Cultural industries depend directly on aesthetic differentiation. In each case, aesthetic orientation participates in the generation of value without being reducible to price.

The relational character of aesthetic judgment is important. Judgments are neither simply arbitrary private tastes nor automatically universal properties of objects. They are formed through histories of training, exposure, comparison, convention, embodiment, and social interaction. What appears elegant to a mathematician, trustworthy to a patient, refined to a consumer, or harmonious to a community can de-

pend on learned repertoires and material environments. Institutions can therefore cultivate, standardize, or marginalize aesthetic criteria.

This relationality creates both generative possibility and power. Shared aesthetic repertoires can coordinate collaboration and make complex quality judgments possible without complete formalization. They can also become exclusionary when dominant groups define legitimate taste, professional style, or intellectual beauty. A funding committee's sense of what constitutes an "interesting" question, for example, may reproduce disciplinary histories that favor some objects and methods. Aesthetic judgment can thus influence resource allocation even when it is not formally acknowledged.

GRE should keep aesthetic judgment distinct from truth, welfare, and justice. An elegant theory can be empirically wrong. A beautiful design can be inaccessible or harmful. A compelling narrative can conceal exploitation. A technically awkward solution can nevertheless generate substantial social value. The analytical significance of aesthetic judgment lies in its role in orientation under uncertainty, not in a presumption that aesthetic approval validates the selected object.

Aesthetic orientation also interacts with serendipity. Encounters that were not sought for instrumental reasons can become generative when a subject experiences them as salient, intriguing, beautiful, strange, or worth pursuing. The generative consequence depends on both encounter and judgment. An environment rich in variation does not guarantee innovation; subjects and institutions must still recognize some differences as invitations to inquiry or creation. This suggests an economic problem of field design: how can environments sustain heterogeneous encounters and exploratory judgment without attempting to pre-engineer the exact novelty that should emerge?

Within GRE, aesthetic judgment therefore belongs to the analysis of orientation because it can influence which possibilities receive further attention, articulation, resources, and institutional support. Its mechanisms require contextual investigation, and its normative status remains open to separate evaluation.

3.9.5 Epistemic Orientation

Economic generation is also directed by epistemic orientation: the standards, classifications, methods, evidential expectations, and interpretive habits through which subjects and institutions decide what can be known, what counts as relevant evidence, and which uncertainties deserve investigation. Epistemic orientation does not merely affect description after economic processes occur. It can shape which processes become actionable and therefore which futures are generated.

Measurement provides a direct example. Once an organization adopts a metric, activity can reorganize around what the metric makes visible. Data collection creates categories, time series, benchmarks, and comparison groups. These representations can improve coordination and accountability, but they also privilege some dimensions over others. A phenomenon that cannot be recorded within the existing schema can remain difficult to govern even when participants experience it as important. Epistemic orientation therefore influences institutional capacity through the design of observability.

Methods likewise orient inquiry. Randomized experiments, econometric identification, ethnography, archival reconstruction, simulation, network analysis, participatory research, and legal interpretation provide access to different dimensions of a problem. Their strengths are domain-specific. When one method becomes institutionally dominant, questions that fit its evidential architecture can become easier to legitimate and fund. GRE's methodological pluralism is partly a response to this orientation effect: the research problem should guide method selection rather than allowing an inherited method to define the only admissible problem.

Classification is another generative mechanism. Administrative categories determine eligibility, statistics, taxation, regulation, and rights. Market classifications affect comparability and exchange. Scientific classifications shape research populations. Professional categories define expertise. Once stabilized, classifications can influence behavior and identity, making the represented distinctions increasingly consequential. Epistemic orientation therefore links representation to ontology without collapsing the two: categories can help generate social effects even though the category remains analytically distinct from the object it represents.

Epistemic orientation has a temporal dimension. Institutions inherit archives, standards, vocabularies, and datasets from earlier periods. These resources make some historical comparisons possible while leaving other experiences poorly recorded. New questions are therefore conditioned by the epistemic infrastructure accumulated in the past. At the same time, present recording decisions shape what future investigators will be able to reconstruct. The organization of knowledge becomes part of intertemporal economic capacity.

Disagreement over epistemic orientation can be productive. Competing models, disciplinary perspectives, and interpretive frameworks can reveal different aspects of a system. GRE does not require premature convergence on a single representation. It asks whether the plurality of representations is explicit, whether their assumptions and domains of validity are understood, and whether institutions preserve the capacity to revise their epistemic orientation when anomalies or changing conditions make existing categories inadequate.

This emphasis also limits the role of formal precision. A precisely estimated quantity can answer a poorly oriented question, while a qualitative observation can reveal a relation that has not yet been formalized. GRE values formal and computational methods where they perform genuine analytical work, but epistemic orientation precedes technique in the sense that the researcher must first decide what distinctions, scales, and forms of evidence are relevant to the inquiry.

3.9.6 Institutional Selection of What Is Generated

Orientation becomes institutional when durable rules, organizations, infrastructures, and evaluative procedures repeatedly privilege some generative pathways over others. Institutions do not need to specify the content of future outcomes in order to shape them. By controlling eligibility, resources, recognition, standards, timing, and access, they can alter which possibilities survive long enough to become self-sustaining.

Funding systems provide an obvious case. Research grants, venture investment,

bank credit, public procurement, philanthropy, and internal organizational budgets each use different selection criteria. Those criteria can favor measurable returns, strategic importance, novelty, reliability, social need, collateral, prior reputation, or compatibility with existing infrastructure. A funding architecture therefore orients generation before the downstream value of a project is known. Its effects accumulate when successful projects create expertise, reputation, and networks that improve their access to future resources.

Legal and regulatory institutions also orient generation. Intellectual-property rules affect incentives and diffusion. Liability rules influence experimentation. Licensing can protect safety while raising entry barriers. Competition policy changes the conditions under which scale can consolidate. Data governance shapes access to informational resources. Labor and social-protection institutions influence the risks subjects can bear when changing occupations or starting new projects. In each case, legal structure changes the feasible and attractive trajectories available to economic actors.

Educational institutions orient generation by shaping capabilities, vocabularies, disciplinary boundaries, and aspirations. Curriculum determines which problems become familiar. Credentials affect access to professions and organizations. Mentorship can make previously invisible pathways imaginable. Evaluation systems influence whether students optimize for standardized performance, exploration, collaboration, or independent inquiry. Education therefore participates in economic generation long before its effects appear as wages or productivity.

Markets themselves are institutional selection environments. Prices, demand, competition, and profitability orient resources toward some activities and away from others. GRE retains this insight while asking how market selection interacts with other orientation mechanisms. Markets depend on property rules, infrastructures, classifications, information, financing, and distributions of purchasing power. A profitable opportunity can reflect genuine social demand, concentrated wealth, regulatory design, network effects, or externalized costs. Market orientation is therefore economically powerful without being normatively self-interpreting.

Platforms and algorithmic systems add another layer by combining infrastructure, ranking, rule enforcement, and data collection. Their selection mechanisms can shape which sellers are visible, which workers receive tasks, which content gains distribution, and which behaviors become economically rewarded. Because participants often adapt to these selection systems, the platform's orientation can become recursive: metrics influence behavior, behavior supplies new data, and new data update the mechanism that structures visibility or access.

Institutional orientation also creates lock-in and complementarity. Once organizations invest in a technology, standard, profession, or accounting category, adjacent investments may become more valuable. Alternative pathways then face higher switching costs even if they are technically feasible. The resulting persistence can be efficient when coordination benefits are large, but it can also preserve arrangements whose original justification has weakened. GRE therefore asks how institutional selection creates future dependency and what forms of optionality remain available.

The analytical objective is not to identify a single institution responsible for ori-

entation. Selection is often distributed across finance, law, culture, infrastructure, expertise, and public authority. A GRE inquiry traces how these mechanisms combine and where control over selection becomes concentrated, contested, or open to revision.

3.9.7 Plural Orientations under Heterogeneous Values

Economic systems contain subjects and communities whose orientations differ. They may disagree about desirable outcomes, relevant time horizons, legitimate evidence, acceptable risk, ecological obligations, cultural continuity, forms of recognition, or the value of particular capabilities. GRE treats this heterogeneity as a constitutive feature of orientation rather than assuming that all relevant directions can be represented by one shared scalar objective.

Plural orientation creates coordination problems. A project that expands aggregate income can weaken a local form of life. A conservation policy can protect ecological conditions while constraining livelihoods unless transition mechanisms are provided. A technological system can increase convenience for users while intensifying surveillance or labor precarity. A research programme can generate broadly useful knowledge while concentrating intellectual property. These tensions cannot always be resolved by discovering a hidden common metric.

Value conversion can help decision making when the conversion rule is explicit and appropriate. Monetary valuation, cost-effectiveness, multi-criteria analysis, voting, deliberation, legal balancing, and negotiated compromise are among the mechanisms institutions use to compare heterogeneous claims. GRE does not reject such conversions. It asks what is gained and lost through them, whose valuations enter the procedure, and whether the conversion becomes mistaken for an ontological equivalence among the values involved.

Plural orientation also means that generativity itself can be evaluated differently. One group may value rapid innovation; another may value reliability and continuity. One institution may prioritize employment; another ecological regeneration; another strategic autonomy; another freedom of inquiry. A relation can therefore be highly generative according to one orientation while appearing destructive according to another. The disagreement concerns both produced outcomes and the standards through which generation is interpreted.

Institutions can respond to plural orientation through several architectures. They can aggregate preferences into a single decision, allocate separate domains of authority, preserve local autonomy, establish rights that constrain aggregation, create deliberative procedures, or maintain experimental diversity across jurisdictions and organizations. Each architecture has generative consequences. Centralization can coordinate large-scale investment but narrow local variation. Decentralization can preserve experimentation but weaken collective capacity. Rights can protect vulnerable subjects while limiting some forms of optimization. GRE treats these trade-offs as empirical and normative objects rather than deriving a universal institutional design.

The distribution of voice matters because heterogeneous values do not enter decision processes with equal force. Wealth, legal status, expertise, organizational ca-

pacity, time, language, and control over infrastructure can affect which orientations become institutionally consequential. A formally plural process can therefore reproduce asymmetry if some actors possess much greater ability to define agendas, supply evidence, or sustain participation. Analysis of orientation must consequently include the conditions of representation and participation.

Plurality also has an epistemic benefit. Different orientations can reveal consequences that a dominant framework misses. Workers, users, local communities, engineers, ecologists, regulators, and investors can perceive different dimensions of the same system. Maintaining structured disagreement can therefore increase the system's capacity to detect emerging harms or opportunities. Diversity of orientation is not automatically valuable, but under some conditions it functions as a distributed sensing and exploration mechanism.

For GRE, the constitutional implication is that economic orientation should remain representationally plural unless a specific analytical or decision context justifies aggregation. Heterogeneous values are not noise to be removed before economic reasoning begins. They are part of the relational field through which generation is directed and evaluated.

3.9.8 Orientation as an Economic and Political Problem

Orientation becomes an economic problem because it influences the allocation and generation of scarce capacities across time. Attention, research effort, capital, infrastructure, education, organizational commitment, and institutional legitimacy cannot be devoted equally to every possibility. Selection therefore shapes which capabilities accumulate, which industries form, which questions receive answers, which risks become visible, and which subjects gain access to future opportunities. Orientation is economically consequential even when no market transaction directly prices it.

It becomes a political problem when the authority to orient generation is unevenly distributed or collectively contested. Governments set research priorities and infrastructure plans. Firms select technologies and business models. Platforms organize visibility. Financial institutions influence investment trajectories. Professional bodies define standards. Universities establish curricula and disciplines. Communities defend or transform local practices. Individuals exercise agency within these fields but do not enter them with equal resources. Orientation is therefore partly a question of who can shape the conditions under which future possibilities become more or less available.

This form of power is upstream from many observable outcomes. Control over a final allocation matters, but control over the categories, infrastructures, questions, and selection procedures through which future allocations will be made can have longer-lived effects. A subject that determines what can be measured, funded, connected, certified, or searched can influence generation without dictating every downstream action. GRE can analyze this as power over generative conditions while still requiring concrete mechanisms rather than inferring power from asymmetry alone.

The political character of orientation also appears in conflicts over temporality. Short electoral cycles, quarterly reporting, long infrastructure lifetimes, ecological regeneration, intergenerational obligations, and scientific research operate on dif-

ferent temporal horizons. Institutions that privilege one horizon can redirect generation away from possibilities whose value emerges later. The question is not simply whether actors discount the future, but how organizational and institutional arrangements determine whose future, which risks, and which forms of value remain actionable in the present.

A generative orientation can also produce foreclosure. Investment in one infrastructure can make alternatives expensive. A dominant technical standard can exclude incompatible innovations. A classification can make some identities administratively invisible. A business model can generate dependency that reduces exit options. Foreclosure is therefore the counterpart of orientation: selecting and reinforcing one trajectory changes the feasibility of others. GRE evaluates orientation partly by tracing these changes in future option sets rather than only immediate outputs.

This does not imply that preserving every option is desirable. Coordination, commitment, specialization, and institution building often require closing alternatives. A society cannot maintain every infrastructure standard simultaneously, and an organization cannot pursue every project. The analytical question concerns the terms under which closure occurs, its reversibility, who bears the resulting constraints, and whether institutions retain capacities for revision when conditions change.

Orientation also connects economic analysis to governance. A governance system can attempt to specify desired outcomes directly, or it can shape fields in which desirable forms of generation are more likely to emerge. The latter approach may involve public infrastructure, open standards, rights, research capacity, plural participation, safety constraints, or mechanisms for feedback and revision. Such field-oriented governance does not eliminate political choice; it relocates part of that choice to the design of enabling and constraining conditions.

The constitutional position of GRE is therefore neither that generation should be maximized nor that orientation should be centralized. GRE makes orientation visible as an object of economic inquiry. It asks how attention, curiosity, aesthetic judgment, epistemic practices, institutions, and heterogeneous values combine to direct generative processes; how orientation distributes future capacities and risks; how power enters selection; and how orientations themselves change through history.

This completes the present chapter's account of one major dimension of GRE's problem-space. Economic generation is mediated by subjects, but subjects themselves are formed through relations; generation is directional, but direction arises through multiple cognitive, institutional, symbolic, and political mechanisms. The next constitutional task is methodological. The following section therefore distinguishes the principal modes through which GRE can describe, explain, reconstruct, compare, interpret, formalize, evaluate, and intervene in the economic processes identified here.

3.10 Modes of GRE Inquiry

Generative Relational Economics requires methodological breadth because its objects are heterogeneous and its questions concern several different kinds of claim. A study may need to describe a relational configuration, explain how it is reproduced, recon-

struct how it emerged historically, compare it with alternative configurations, interpret the meanings through which subjects act, identify causal effects, formalize a mechanism, simulate possible trajectories, evaluate consequences normatively, or design an intervention. These tasks are related, but they are not interchangeable. The role of this section is to distinguish the principal modes through which GRE can conduct inquiry while preserving their mutual compatibility. Its objective is methodological clarification rather than the prescription of a single research design. The discussion proceeds from descriptive and explanatory inquiry through historical, comparative, interpretive, causal, formal, computational, normative, and intervention-oriented modes. Across them, the governing principle is that each mode must make explicit what kind of claim it is entitled to support, which evidence or representation bears that claim, and where its warrant ends.

The distinction among modes concerns the epistemic work being performed rather than a rigid classification of disciplines or techniques. An interview can contribute to descriptive, interpretive, historical, causal, or normative inquiry depending on how it is used. A regression can support description, comparison, or causal inference under different designs. Archival material can reconstruct a historical sequence while also revealing institutional meanings and mechanisms. A simulation can clarify the consequences of specified assumptions without establishing that the modeled mechanism exists empirically. GRE therefore classifies inquiry by the relation between question, evidence, representation, and warranted conclusion rather than by the surface form of the method alone.

The modes also differ from the objects and scales identified earlier in this chapter. The same object can be approached through several modes. A platform can be described as an organization and infrastructure, interpreted through the classifications embedded in its interface, studied causally through changes in ranking rules, reconstructed historically through its institutional development, represented formally as a multilayer network, evaluated normatively through the distribution of generated capacities and harms, and examined interventionally through alternative governance designs. Methodological plurality becomes useful precisely because the object does not determine a unique mode of inquiry.

GRE does not require every project to use every mode. A narrowly designed causal study can be valuable if its boundaries are clear. A historical reconstruction can illuminate the emergence of a generative structure without formalization. An interpretive study can reveal categories that would otherwise be mismeasured. A formal model can clarify possible mechanisms before adequate data exist. The methodological demand is therefore fit rather than comprehensiveness: the mode or combination of modes should match the question and should remain corrigible by evidence or arguments arising from other modes when their domains overlap.

3.10.1 Descriptive Inquiry

Descriptive inquiry establishes what is present, how it is distributed, how it is related, and how it changes over a specified observational domain. In GRE, description can concern entities, subjects, relations, resources, capacities, forms of value, constraints, institutional rules, symbolic representations, trajectories, or fields. Its importance

is easily underestimated because description is sometimes treated as a preliminary stage before "real" explanation. Yet a relational research programme depends heavily on careful description: a mistaken boundary, omitted relation, inappropriate unit, or unstable category can distort every later explanatory or normative claim.

A GRE description is therefore more than an inventory of isolated attributes. It can map relational incidence: who is connected to whom, through which mechanism, under what terms, and with what asymmetries. It can characterize distributions of access, exposure, recognition, risk, or capability. It can identify temporal patterns such as persistence, turnover, accumulation, or decay. It can distinguish administrative recipients from affected subjects and can trace where value, constraints, or opportunities appear outside the nominal boundary of a programme or transaction. Description thereby makes the relational field empirically available before deeper attribution is attempted.

The construction of descriptive categories requires explicit judgment. Terms such as worker, household, platform, community, firm, beneficiary, asset, skill, trust, or harm are not self-interpreting. Their operationalization can depend on legal definitions, institutional records, self-identification, measurement conventions, or analytical reconstruction. GRE therefore treats descriptive categories as representations whose adequacy must be justified relative to the question and scale. A category can be useful without being ontologically final, and a stable administrative classification can remain inadequate for a relational question if it suppresses relevant interactions or affected subjects.

Description also has a temporal dimension. Cross-sectional description captures a configuration at a moment or interval, while longitudinal description tracks changes in states, relations, or distributions. The latter becomes especially important when generation concerns future capacities. A programme that appears distributively modest at one date may substantially change later educational, technological, organizational, or relational possibilities. Conversely, an apparent short-term gain may dissipate or convert into dependence. Descriptive inquiry can reveal these trajectories without yet claiming a mechanism for them.

Rich description can combine quantitative and qualitative evidence. Administrative records may establish scale and distribution; interviews may reveal unrecorded relations; ethnographic observation may show how formal rules are enacted; network data may identify patterns of connectivity; documents may clarify institutional categories; spatial data may reveal infrastructural concentration. GRE has no reason to privilege one evidence type in advance. The relevant standard is whether the descriptive representation captures the features required by the question while making omissions and uncertainty visible.

Descriptive adequacy also depends on boundaries. A study of a firm's wage policy can stop at employees, extend to households, include subcontractors, or incorporate local labor markets and public services. Each boundary produces a different descriptive object. GRE does not assume that the widest boundary is always best; wider boundaries increase complexity and can reduce tractability. The researcher instead states why a boundary is appropriate and tests whether excluded relations materially alter the description.

The output of descriptive inquiry is therefore a warranted account of configuration rather than a claim about why the configuration exists. It establishes patterns that explanatory, historical, causal, interpretive, or normative inquiry may subsequently address. In GRE, this mode is foundational because relational and generative claims become meaningful only after the relevant configurations, transitions, and affected subjects have been specified with sufficient empirical discipline.

3.10.2 Explanatory Inquiry

Explanatory inquiry asks how and why an observed configuration, transition, or regularity occurs. GRE gives particular attention to mechanisms through which relations produce, reproduce, transform, amplify, or constrain later possibilities. Explanation can therefore address immediate effects, recursive feedback, institutional reproduction, conversion among forms of value, subject formation, cross-scale propagation, or changes in the conditions under which subsequent generation occurs.

Explanation requires more than naming a correlation or attaching a familiar concept to an outcome. To say that an outcome results from power, incentives, norms, networks, institutions, culture, or path dependence is incomplete unless the operative process is specified sufficiently to connect conditions to consequences. A GRE explanation should identify the relevant actors or configurations, the relations through which effects travel, the enabling and constraining conditions, the temporal sequence where it matters, and the observations that would distinguish the proposed mechanism from plausible alternatives.

Mechanistic explanation can operate at different levels. A change in organizational behavior may be explained through individual incentives, professional norms, governance rules, technological affordances, inter-organizational dependence, or combinations among them. These explanations need not compete if they address different parts of the process. GRE is particularly interested in explanations that connect levels without treating one as automatically fundamental. A legal rule can alter organizational incentives; organizational practices can reshape individual capabilities; repeated individual actions can stabilize a convention; a convention can later become codified. The explanatory task is to show how these relations connect rather than to reduce them to a single privileged scale.

Generative explanation extends the temporal horizon beyond the immediate outcome. A scholarship programme may explain increased enrollment through reduced cost, but GRE may also ask how participation generates networks, expectations, credentials, institutional capacities, or new constraints that alter later educational and labor-market trajectories. This does not mean every explanation must trace indefinitely downstream. It means that when later capacities are central to the research question, the explanatory account should not stop at the first measurable output merely because it is administratively convenient.

Explanatory inquiry can draw on several other modes. Historical evidence can reveal how a mechanism became possible. Interpretive evidence can show how subjects understand and respond to classifications. Causal designs can estimate whether an intervention changes an outcome. Formal models can clarify whether a proposed mechanism is internally coherent. Comparative cases can test whether the explana-

tion travels across configurations. Computational models can explore implications that are difficult to derive analytically. Explanation is therefore often integrative, but the contributions of these components should remain distinguishable.

The standard of explanatory sufficiency depends on the claim. A local explanation of a policy effect requires less than a theory of institutional transformation. Claims about altered generative conditions require evidence that the later opportunity structure, rule environment, capacities, or relations changed in a way relevant to subsequent processes. Claims about transformation of the effective rule of change require still stronger evidence that the mechanism governing later transitions itself changed. GRE therefore scales explanatory ambition to evidential support.

Explanatory inquiry is central to GRE because the framework is concerned with more than relational association. It seeks to understand how relations become consequential through identifiable processes. At the same time, explanation remains compatible with ontological suspension: a useful mechanism model can explain an empirical pattern without establishing that its analytical categories constitute the ultimate ontology of the economic system.

3.10.3 Historical Inquiry

Historical inquiry reconstructs how economic configurations, categories, subjects, institutions, and generative conditions emerge and transform through time. Its role in GRE is constitutive rather than supplementary. If entities and relations can be historically generated, then their present form cannot always be understood by treating them as fixed inputs to analysis. Historical inquiry asks how the objects that later appear stable became available, how alternative possibilities were closed or retained, and how prior trajectories condition present generative capacity.

A historical GRE study can begin with an institution, technology, classification, market, profession, infrastructure, or relation and reconstruct the sequences through which it acquired its current form. The relevant history may include legislation, organizational decisions, conflict, technical development, demographic change, cultural interpretation, investment, crises, accidents, or encounters with other systems. The aim is not to produce chronology for its own sake. The analytical objective is to identify transformations that changed what later actors could perceive, do, coordinate, own, exchange, contest, or generate.

Historical inquiry is especially important for categories that appear natural after stabilization. The distinction between employee and contractor, the legal form of a corporation, a standardized credential, a property right, a data category, a currency regime, or a professional jurisdiction can become embedded in administrative systems and everyday expectations. Once stabilized, these categories structure evidence and action. Historical reconstruction can reveal their contingency, the relations that produced them, and the alternatives that were once viable. Such reconstruction supports ontological suspension by showing that analytical objects may have histories of constitution.

Temporal ordering can also bear explanatory weight. The same set of conditions can produce different outcomes when encountered in different sequences. Early infrastructure can create increasing returns; a legal designation can precede and en-

able market formation; a crisis can accelerate an institution that had previously remained marginal; a technical standard can become difficult to displace after complementary investments accumulate. Historical inquiry can therefore identify path-dependent mechanisms while avoiding the loose use of "history matters" as an explanation.

GRE also treats methods and evaluative categories as historical. What counts as reliable evidence, recognized value, legitimate participation, acceptable risk, or relevant harm can change. A historical study may therefore examine not only the object of evaluation but the evolution of the evaluative and epistemic apparatus itself. This becomes particularly important when contemporary assessment applies categories that did not exist, had different meanings, or excluded relevant subjects in earlier periods.

Historical evidence is heterogeneous. Archives, legal documents, organizational records, correspondence, material artifacts, statistical series, oral histories, media, technical standards, and retrospective testimony can each illuminate different aspects of a process. Their survival is itself selective. GRE therefore treats the archive as part of the historical relational field: who could record, whose records were preserved, which categories were administratively legible, and which forms of experience remained unrecorded can shape what later researchers are able to reconstruct.

Historical inquiry does not imply that every present problem requires a complete genealogy. The relevant temporal horizon depends on the process. Some mechanisms can be understood through recent organizational history; others depend on decades of institutional accumulation or longer histories of law, infrastructure, or social classification. The methodological requirement is to extend the historical frame far enough that the object and its operative conditions are not mistakenly treated as timeless when their formation is relevant to the explanation.

3.10.4 Comparative Inquiry

Comparative inquiry examines similarities and differences across cases, configurations, periods, scales, or institutional arrangements. In GRE, comparison is valuable because relational and generative mechanisms are often conditional. A relation that generates capability in one institutional environment may generate dependence in another; a governance arrangement that supports participation at one scale may produce exclusion at another; the same technology can reorganize value differently under different property, labor, or regulatory structures.

Comparison can therefore reveal which features are specific to a configuration and which travel across contexts. Cases may be organizations, regions, legal systems, historical episodes, technologies, communities, markets, or interventions. A comparison can hold some features relatively stable while examining variation in others, or it can compare broader configurations whose differences are themselves analytically meaningful. GRE does not require all comparisons to approximate experiments. Configurational comparison can be valuable when the research question concerns how combinations of relations produce different generative trajectories.

The major methodological problem is commensurability. Cases become comparable only through selected dimensions, and the choice of dimensions can obscure

differences in meaning or institutional constitution. "Employment," "household income," "community participation," or "innovation" may be measured similarly across jurisdictions while referring to materially different social arrangements. Comparative inquiry must therefore justify both the common dimension and the retained differences. Translation among categories can be part of the research rather than a preliminary technical step.

Comparison across time presents a related problem. A variable can retain its label while the institutional relations that constitute it change. Longitudinal comparisons of occupations, assets, industries, educational attainment, or household forms may therefore require attention to changing definitions and social significance. GRE treats historical comparability as an empirical and interpretive achievement, not an automatic consequence of having a numerical series.

Comparative inquiry is also useful for mechanism assessment. If a proposed explanation depends on a particular relation, cases in which that relation differs can help evaluate the claim. A platform governance mechanism can be compared across ownership models; a welfare intervention across administrative designs; a cooperative across legal environments; a knowledge commons across licensing regimes. The objective is not necessarily to identify a single universally best arrangement. Comparison can instead map how different relational configurations generate different distributions of capacity, value, risk, or closure.

Negative and deviant cases can be especially informative. A case in which an expected self-reinforcing process fails may reveal a missing enabling condition. A community that resists a dominant institutional trajectory can disclose alternative relations that preserve options. A technological diffusion that remains limited despite strong incentives may reveal interpretive, infrastructural, or legal constraints. GRE can use such cases to refine mechanisms rather than treating them as noise around an average effect.

Comparative inquiry thus provides a disciplined way to study plurality. It can test portability without assuming invariance, and it can illuminate alternative economic arrangements without reducing them to a single ranking dimension. Its contribution is strongest when the basis of comparison, the boundaries of each case, and the limits of generalization are stated explicitly.

3.10.5 Interpretive Inquiry

Interpretive inquiry examines the meanings, classifications, narratives, symbols, expectations, and practical understandings through which economic subjects perceive and act within relational configurations. GRE requires this mode because many economic objects are symbolically mediated. Prices, contracts, credentials, reputations, categories, metrics, risk scores, organizational roles, and legal statuses acquire consequences partly through shared or contested interpretations.

Interpretation enters economic processes in several ways. Subjects respond to what they believe a rule requires, what they expect others to do, what a category signifies, or what an action communicates. An institutional classification can alter behavior because it changes eligibility or sanctions, but also because subjects understand themselves and others through it. A market signal can influence investment be-

cause actors interpret its informational content. A policy can fail because its official category does not correspond to the categories through which affected communities organize practice. Meaning is therefore neither an ornamental layer nor a universal substitute for material explanation. It is one mechanism through which relations become actionable.

Interpretive inquiry can focus on language, documents, interviews, practices, rituals, interfaces, images, classifications, or institutional procedures. The researcher asks how a representation is produced, which distinctions it makes salient, how subjects use or contest it, and what practical consequences follow. Interpretive evidence can reveal why formally identical incentives generate different responses, why some risks remain unrecognized, or why an institutional reform changes subject positions even when resource distributions move little.

GRE distinguishes the meaning attributed by subjects from the analyst's representation. Researchers can misdescribe a relation if they impose categories that erase locally consequential distinctions. Conversely, subjects' interpretations do not exhaust causal explanation. An institution can have effects that participants neither intend nor perceive. Interpretive inquiry therefore contributes one layer of evidence within a plural methodology: it reconstructs situated meaning while remaining open to material, institutional, statistical, and historical evidence about effects beyond conscious understanding.

Symbolic mediation becomes particularly important under conditions of representational abundance. Rankings, dashboards, automated classifications, recommendation systems, financial models, and AI-generated representations can shape what becomes visible and credible. Interpretive inquiry can examine how these representations acquire authority and how subjects orient action around them. It can also ask how categories designed for one purpose migrate into other domains and begin to organize allocation, recognition, or exclusion.

Interpretive disagreement is itself an economic phenomenon. Different actors may attach incompatible meanings to the same resource, relation, technology, or institutional change. A redevelopment project can signify investment to one group and displacement to another; data sharing can signify innovation, surveillance, or public infrastructure depending on the relation. GRE does not require these meanings to be collapsed into a single utility metric before analysis begins. Their coexistence can shape conflict, coalition, legitimacy, and future generative possibilities.

Interpretive inquiry thus expands what counts as economically relevant evidence while remaining disciplined by context and consequence. Its aim is not to replace causal or material analysis with discourse, but to identify when meaning and representation form part of the mechanism through which economic relations are generated, sustained, or transformed.

3.10.6 Causal Inquiry

Causal inquiry asks whether and through what conditions a change in one factor contributes to a change in another. GRE requires causal discipline because relational language can otherwise encourage unwarranted attribution. The presence of a relation, asymmetry, institution, or field does not by itself establish that it caused an

observed outcome. Causal inquiry therefore provides tools for distinguishing association, sequence, mechanism, and intervention-relevant effect.

Causal questions can be narrow or generative. A narrow question may ask whether a transfer increases school attendance. A broader question may ask whether the transfer changes household bargaining, peer networks, expectations, credential accumulation, or later labor-market options. These questions operate on different outcomes and time horizons, and they may require different designs. GRE's contribution is not to replace established causal inference but to broaden the set of causally relevant downstream and relational outcomes when theory gives reason to expect them.

Counterfactual reasoning remains central. To claim that an intervention caused an outcome requires some account of what would have occurred under a relevant alternative. Randomization, natural experiments, quasi-experimental designs, matching, synthetic controls, longitudinal models, process tracing, comparative case analysis, and mechanistic evidence can support counterfactual claims under different assumptions. GRE is methodologically plural about these tools but not indifferent to identification. The choice of design must match the causal claim.

Relational settings create additional challenges. Interference can violate assumptions that one unit's treatment does not affect another. Network spillovers can make the administrative recipient a poor unit for causal analysis. Institutional reforms can change the categories through which outcomes are measured. Feedback can make causes and effects mutually reinforcing across time. Selection into relationships can confound observed associations. GRE therefore treats relational structure as part of causal design rather than as a reason to abandon causal inference.

Causal attribution can also be distributed. A harmful outcome may depend on a sequence of financing rules, organizational incentives, technical standards, local decisions, and infrastructural constraints. No single element is sufficient on its own, yet the configuration can reliably generate the outcome. GRE can analyze such conjunctural causation while distinguishing it from claims that every contributing condition bears equal explanatory or normative weight.

Generative causal inquiry may ask whether an intervention changes later capacities to produce further effects. This creates nested causal questions. A training programme can directly change skill, which changes network access, which changes employment opportunities, which changes household investment. The causal chain can branch and feed back. Researchers need not estimate every link simultaneously, but they should distinguish measured effects from hypothesized downstream mechanisms and avoid presenting an observed endpoint as evidence for the entire generative story.

Causal inquiry therefore disciplines GRE's ambition. It permits strong claims where design and evidence support them and encourages restraint where mechanisms remain plausible but unverified. Relational complexity expands the causal questions worth asking; it does not lower the evidential burden for answering them.

3.10.7 Formal Inquiry

Formal inquiry constructs explicit representations of economic structures or processes in mathematical, logical, graphical, or computationally specified form. Its role in GRE is clarification. Formalization can make assumptions visible, expose inconsistencies, distinguish mechanisms that natural language leaves conflated, derive consequences, and reveal which empirical observations would discriminate among alternative accounts.

The appropriate formalism depends on the problem. Dynamical systems can represent trajectories, stability, and regime change. Networks and hypergraphs can represent relational topology and higher-order interaction. Multilayer structures can distinguish relation types. Optimization and game-theoretic models can clarify strategic constraints and incentive compatibility. Probabilistic models can represent uncertainty and conditional dependence. Field-like representations can describe distributed conditions when locality or spatial organization matters. Logical or categorical formalisms can clarify compositional structure. GRE does not designate one of these as its universal mathematics.

Formal inquiry begins by specifying what the symbols represent. A node may stand for a person, organization, legal entity, document, or technical component; an edge may encode communication, ownership, exchange, dependency, recognition, or another relation. A state variable can summarize a capacity, stock, classification, or measured condition. The model becomes meaningful only through the mapping between formal object and empirical interpretation. Two models with identical mathematics can therefore represent substantively different economic mechanisms.

Formalization also requires ontological restraint. A network representation does not prove that the economy is fundamentally a network, and a state-space model does not establish that the selected variables constitute a complete economic state. The formal representation is an analytical instrument whose adequacy depends on the question, assumptions, and empirical correspondence. GRE's ontological suspension is compatible with strong formal work precisely because it separates representational usefulness from metaphysical commitment.

One important use of formal inquiry is to distinguish levels of transformation. A model can represent change in state under fixed rules, changes in parameters, changes in topology, or transformations in the effective rule itself. These are different formal problems. GRE's concern with changing generative conditions becomes clearer when the model states which elements are permitted to vary and which remain fixed. A formalism that endogenizes network ties while fixing node identities captures one form of relational change but leaves other forms outside the model.

Formal inquiry can also produce impossibility or boundary results. Under specified assumptions, certain combinations of objectives may be incompatible; some allocation rules may generate unavoidable trade-offs; some dynamics may be unstable; some information may be insufficient for identification. Such results can be valuable even when the assumptions are idealized because they clarify where a proposed intervention requires additional structure or information.

The evidential status of a formal result must nevertheless remain explicit. A theorem establishes a consequence of assumptions. A numerical model shows behavior

of a specified representation. Neither alone establishes that the assumptions hold empirically. Formal inquiry becomes empirically explanatory when the mapping, assumptions, and relevant predictions or mechanisms are supported by evidence. GRE therefore treats formalization as one rigorous mode among several, especially powerful when combined with descriptive, historical, causal, or interpretive work.

3.10.8 Computational Inquiry

Computational inquiry uses algorithmic procedures to analyze data, simulate specified systems, explore high-dimensional models, search large possibility spaces, or construct representations that would be difficult to handle analytically. It overlaps with formal inquiry but is not identical to it. A formal model can be studied without computation, while computational analysis can involve empirical pattern detection whose theoretical structure remains comparatively weak. GRE distinguishes these uses so that computational power is not mistaken for explanatory completeness.

Simulation is one major application. Agent-based models can explore how heterogeneous local rules generate aggregate patterns; network simulations can study diffusion, contagion, coordination, or rewiring; dynamical models can examine sensitivity and regime change; Monte Carlo methods can characterize uncertainty; optimization algorithms can explore feasible designs under constraints. Simulation is particularly useful when feedback, heterogeneity, or combinatorial complexity makes closed-form analysis difficult.

The epistemic status of simulation remains conditional. A simulated trajectory is evidence about the behavior of the model under specified assumptions. It becomes evidence about a target economic system only through an additional argument that the model represents relevant features adequately. Calibration, validation, sensitivity analysis, out-of-sample comparison, qualitative mechanism matching, and robustness checks can strengthen this bridge. The visual plausibility of a simulated pattern is insufficient on its own.

Computational inquiry also includes data-intensive empirical methods. Machine learning can classify, predict, embed, cluster, or detect patterns in large datasets. Natural-language processing can analyze documents and discourse. Network algorithms can identify structural positions or communities. Spatial computation can reveal geographical concentration and accessibility. These methods can extend observational capacity, but the resulting representations inherit the categories, sampling processes, missingness, labels, and objectives of the data-generating system.

For GRE, computational representation can itself become an object of inquiry. A credit score, recommendation model, allocation algorithm, or generative AI system does not merely describe an economic field; once used operationally, it can alter access, visibility, bargaining power, subject classification, and future data. The computational model can therefore enter the generative relation it represents. Researchers may need to study both model performance and the feedback through which deployment changes the target system.

Computation can further support exploratory work under ontological uncertainty. Researchers can test several network boundaries, alternative state representations, or competing mechanisms and examine which are robust to changes in specification.

Such exploration is valuable if it is reported transparently and distinguished from confirmatory inference. Computational flexibility increases the importance of documenting choices because many plausible pipelines can yield different apparent structures.

GRE therefore welcomes computational inquiry without treating computation as a substitute for theory, meaning, causality, or normative judgment. Its contribution lies in extending what can be represented and explored while maintaining explicit links among algorithm, data, modeled object, and warranted conclusion.

3.10.9 Normative Inquiry

Normative inquiry evaluates economic arrangements, relations, processes, or interventions according to articulated standards of value, justice, participation, capability, harm, responsibility, freedom, sustainability, or other justified criteria. GRE requires this mode because generativity is not intrinsically beneficial. A relation can generate wealth and dependency, knowledge and exclusion, capability and ecological damage, trust and vulnerability, innovation and concentration. Description of generation therefore cannot settle whether the generated configuration is desirable.

Normative inquiry begins by making the evaluative standard visible. A study may evaluate distribution, procedure, recognition, participation, capability, rights, ecological integrity, intergenerational effects, or the preservation of future options. These standards can converge in some cases and conflict in others. GRE does not resolve such conflict by assuming that all values can be converted into a common metric. Monetary valuation, utility, capability, rights, and relational goods can each illuminate different dimensions while leaving remainders that resist equivalence.

The distinction between generated value and generated harm is central. An intervention that expands productive capacity can simultaneously concentrate decision authority. Infrastructure can increase mobility while displacing communities. A platform can create new forms of participation while producing surveillance or dependency. Normative inquiry therefore follows the distribution and conversion of effects across subjects, scales, and time rather than assigning the entire process a single positive or negative label from one immediate outcome.

Participation matters both instrumentally and intrinsically. Subjects affected by an intervention may hold knowledge unavailable to designers, making participation epistemically valuable. Participation can also constitute recognition and agency rather than merely improve technical outcomes. Yet participation itself varies in form and power. Consultation, veto authority, co-design, ownership, and self-governance are not equivalent. GRE can therefore examine the relational structure of participation rather than treating its nominal presence as sufficient.

Normative inquiry also addresses capability and future generativity. An arrangement can be evaluated partly by how it changes subjects' capacities to act, learn, cooperate, exit, contest, or generate further value. This future-oriented criterion does not imply that more capability is always better or that every option must be preserved. Some capabilities are harmful, and institutional commitments often require selective closure. The normative problem concerns which capacities are expanded or foreclosed, for whom, under what justification, and with what possibilities for revision.

Evaluation must remain historically and contextually responsive. Normative concepts can have general aspirations while their application depends on institutions, technologies, ecological conditions, and available alternatives. Standards themselves can also be criticized and revised through new knowledge or previously excluded perspectives. GRE therefore treats normative inquiry as reasoned and contestable rather than as a final scoring procedure appended after positive analysis.

The mode remains analytically distinct from empirical explanation even when the two interact. Evidence can show who is harmed, which capacities change, or how participation is distributed. It cannot by itself determine how conflicting claims should be weighted. Conversely, normative arguments that ignore empirical mechanisms can recommend interventions that reproduce the very harms they seek to address. GRE joins the modes through mutual constraint while preserving the distinction between what occurs and how it ought to be evaluated.

3.10.10 Intervention-Oriented Inquiry

Intervention-oriented inquiry asks how knowledge can inform deliberate attempts to alter a relational configuration, its generative conditions, or the processes through which future outcomes are produced. It is distinct from normative inquiry because deciding that a condition is undesirable does not establish how it can be changed. It is also distinct from causal inquiry because estimating the effect of one intervention does not by itself provide a complete strategy for governance under changing conditions.

A GRE intervention begins with diagnosis. The researcher or practitioner identifies the relevant relations, subjects, constraints, capacities, value flows, representations, and scales. The intervention target may be an allocation, a rule, an infrastructure, a relation among organizations, an information environment, a participation mechanism, or a field condition that makes certain actions easier or harder. This breadth allows GRE to consider interventions that modify generative conditions rather than only redistribute final outputs.

Intervention design then requires an explicit theory of change. Which relation is expected to change? Through what mechanism? Which subjects can respond? Which enabling conditions are required? What downstream pathways are anticipated? Which unintended effects are plausible? At what time horizon should evaluation occur? These questions prevent “relational intervention” from becoming a vague label for any complex policy.

Field-oriented intervention is one important possibility. Instead of specifying a single terminal outcome, governance can alter conditions under which desirable forms of generation become more feasible. Open standards can lower barriers to entry; public infrastructure can expand capability; rights can protect participation; information systems can make harms visible; funding structures can diversify inquiry; modular regulation can preserve reversibility. Such approaches remain interventions with distributive and political consequences even when they do not centrally prescribe final behavior.

Intervention-oriented inquiry also requires feedback. Economic systems respond to policy, and subjects can adapt strategically or creatively. An initially effective rule

can become ineffective after behavior changes. A subsidy can create dependence; a measurement target can be gamed; a new right can generate institutional innovation; an infrastructure can enable uses that designers did not anticipate. GRE therefore treats monitoring and revision as part of intervention rather than as post hoc maintenance.

Reversibility and repair deserve explicit attention. Some interventions are easy to modify, while others create sunk costs, legal entitlements, ecological damage, technical lock-in, or institutional dependencies. An intervention that transforms generative conditions can make later reversal difficult even if the original allocation was modest. Design can therefore consider exit, rollback, sunset, compensation, remediation, and mechanisms for affected subjects to challenge or revise the arrangement.

Intervention-oriented inquiry is necessarily ethical and political. Choosing what to change, whose capacities to expand, which risks to accept, and which alternatives to close involves normative judgment and distributions of authority. Technical sophistication cannot remove these questions. What GRE can contribute is a disciplined account of how proposed interventions enter relational fields, how their effects propagate beyond immediate recipients, how they alter future capacities and constraints, and how governance can remain responsive to evidence and contestation.

The ten modes distinguished in this section are therefore complementary ways of making GRE's research programme operational. Descriptive inquiry establishes configurations; explanatory inquiry identifies mechanisms; historical inquiry reconstructs formation; comparative inquiry tests variation and plurality; interpretive inquiry recovers meaning and symbolic mediation; causal inquiry disciplines attribution; formal inquiry clarifies explicit structures; computational inquiry extends representation and exploration; normative inquiry evaluates consequences and arrangements; and intervention-oriented inquiry connects analysis to deliberate change. Their combination is problem-dependent rather than fixed.

Methodological plurality, however, requires epistemic discipline. Combining modes does not automatically produce stronger knowledge if their assumptions, evidential statuses, and inferential limits remain implicit. The next constitutional task is therefore to state the commitments that govern how GRE moves among these modes: ontological suspension, partial observation, distinction between relation and representation, explicit boundary and scale selection, mechanism-sensitive attribution, historical dependence, methodological pluralism, revisability, and epistemic humility.

3.11 Epistemic Commitments of GRE

The methodological plurality established in the preceding section creates a further constitutional requirement. If Generative Relational Economics permits descriptive, historical, interpretive, causal, formal, computational, normative, and intervention-oriented inquiry, it also requires standards governing how claims move across those modes and how uncertainty is represented. Methodological plurality without epistemic discipline can produce a collection of incompatible assertions whose evidential status remains unclear. The role of this section is therefore to state the principal

epistemic commitments that constrain GRE inquiry across methods and domains. Its objective is neither to supply a complete philosophy of science nor to impose a single theory of knowledge. It instead specifies a working discipline for research conducted under relational complexity, historical change, partial observability, heterogeneous forms of evidence, and revisable analytical categories.

The commitments are organized around nine requirements: ontological suspension, acknowledgment of partial observation, separation of relation from representation, explicit boundary and scale selection, mechanism before unwarranted attribution, historical and contextual dependence, methodological pluralism, revisability of analytical categories, and epistemic humility. They are mutually reinforcing. Ontological suspension restrains the conversion of useful models into premature metaphysical claims. Partial observation prevents the observed record from being equated with the whole relational configuration. Distinguishing relation from representation keeps measurements, categories, graphs, narratives, and models analytically separate from the processes they represent. Explicit boundary and scale selection makes exclusions visible. Mechanism disciplines attribution. Historical dependence limits the portability of claims across contexts and periods. Methodological pluralism allows different forms of evidence to correct one another. Revisability makes the analytical vocabulary responsive to changing objects and evidence. Epistemic humility calibrates the strength of conclusions to the scope of their warrant.

These commitments do not require a researcher to remain permanently agnostic about every substantive question. GRE can make strong empirical or theoretical claims when evidence, design, and argument justify them. The commitments instead determine what must be shown before such strength is warranted. A causal estimate obtained from a credible design can support a bounded causal claim. A historically reconstructed mechanism can support an explanation when the documentary and comparative record is sufficiently strong. A formal theorem can establish consequences within a defined model. A normative argument can defend criteria under stated premises. Epistemic restraint does not weaken inquiry; it clarifies where the force of a conclusion comes from and which transformations of the claim would exceed the evidence that supports it.

The same discipline is particularly important because GRE studies processes that may alter the categories through which they are observed. A platform can reorganize what counts as work, a legal reform can alter the recognized economic subject, an accounting standard can change what becomes economically visible, an artificial system can redistribute capacities among human and organizational actors, and a governance intervention can transform the relations that later measurements attempt to describe. In such settings, the research object and the research representation can co-evolve. GRE therefore requires epistemic commitments that are compatible with historical transformation rather than assuming a permanently fixed ontology, vocabulary, or observation regime.

3.11.1 Ontological Suspension

Ontological suspension is the first epistemic commitment because GRE deliberately works with heterogeneous representations of economic reality. An inquiry may describe persons, organizations, institutions, flows, relations, fields, trajectories, networks, states, constraints, events, capacities, or symbolic objects. Each representation can disclose features that another suppresses. GRE therefore withholds claims about the ultimate ontological status of these objects unless the local inquiry requires such a claim and adequate argument is available.

Ontological suspension does not imply that nothing exists independently of description, nor does it reduce inquiry to arbitrary perspectivism. It is a methodological restraint concerning the relation between analytical usefulness and metaphysical conclusion. Treating a firm as an entity can be economically useful because the firm has relatively stable legal, organizational, accounting, and decision-making properties. Treating the same firm as a nexus of contracts, a field of authority, a network of relations, a bundle of productive capacities, or a historical process can also be useful for other questions. The availability of several productive representations does not by itself decide which description identifies the firm's final or most fundamental mode of being.

This suspension is especially important when scientific formalisms are transferred into economic analysis. A state space can organize possible configurations without proving that the economy literally consists of points in a pre-given mathematical space. A network model can represent relations without proving that node and edge ontology is fundamental. A field representation can model distributed conditions without establishing a physical field ontology for social life. An agent-based model can operationalize actors without settling the philosophical status of agency. GRE treats such formalisms as analytical constructions whose adequacy depends on the question, assumptions, empirical correspondence, and explanatory gain.

The commitment also protects inquiry against premature reduction. Economic value need not be reduced to price because price is measurable. Institutional recognition need not be reduced to individual preference because choice data are available. Collective capacities need not be reduced to the sum of personal attributes when organizational relations contribute to what can be done. Conversely, relational language does not license the reduction of entities to relations in every context. Relational constitution and relative entityhood can coexist at different scales and for different purposes.

Ontological suspension therefore supports a layered practice of commitment. GRE can commit locally to an operational ontology for a study: it may define firms, households, algorithms, jurisdictions, or communities as analytical units and proceed rigorously within that specification. The suspension concerns the elevation of that local choice into a universal claim. A representation is adequate when it supports warranted inquiry into the relevant mechanism or phenomenon; it becomes ontologically overextended when its convenience is treated as proof that excluded dimensions are unreal or insignificant.

This commitment also preserves the possibility of theoretical correction. New evidence can reveal that an apparently stable entity is internally heterogeneous, that a

presumed relation is mediated by an unobserved institution, or that a category formerly treated as natural is historically contingent. GRE should permit the analytical ontology to change with the inquiry rather than defend the initial representation merely because it was useful at an earlier stage. Ontological suspension is thus not indecision. It is a discipline of keeping the strength of ontological claims proportionate to the work they actually perform.

3.11.2 Partial Observation

GRE assumes that economic observation is structurally partial. Researchers encounter traces, measurements, classifications, documents, transactions, interviews, images, records, behavioral outputs, and other manifestations of processes rather than an exhaustive presentation of the processes themselves. This partiality is not a temporary defect that disappears once sufficiently large datasets are obtained. Even abundant observation remains conditioned by what can be recorded, which categories are used, which events become legible, which populations are included, and which temporal or relational scales are accessible.

Partial observation has several forms. Some variables are simply unobserved. Others are observed through proxies whose validity depends on context. Some relations leave weak administrative traces. Informal activity may be systematically missing from official records. Household labor can remain economically consequential while being absent from market transactions. Platform data can be highly granular while revealing little about off-platform constraints. Historical archives can preserve institutional voices more consistently than marginalized ones. A sensor system can continuously observe behavior while remaining unable to identify meaning or motive. The volume of evidence therefore does not determine its completeness.

The relational character of GRE makes this issue especially consequential. Observing an individual without observing relevant relations can produce a misleading description of capacity, constraint, or choice. A worker's income does not fully disclose bargaining power, household obligations, visa dependence, care responsibilities, access to infrastructure, or exposure to algorithmic evaluation. A firm's balance sheet can omit the public infrastructures, ecological dependencies, cultural resources, or community relations that condition production. A policy's administrative beneficiary list can omit subjects affected through prices, labor markets, household relations, ecological effects, or institutional precedents.

Partial observation also has a temporal dimension. Data may capture a process after important generative events have already occurred. Current inequality can reflect earlier institutional selections that are no longer directly visible. An observed preference can be the result of prior adaptation, exclusion, learning, or habituation. A stable relation may have emerged from a sequence of contingencies that cross-sectional evidence cannot recover. GRE therefore distinguishes observing a current configuration from knowing the history that generated it.

The commitment to partial observation changes how evidence is reported. Missingness, measurement error, selection, proxy construction, archival survival, model dependence, and unobserved mediation should be treated as substantive features of the epistemic situation rather than technical footnotes. A study need not solve every

limitation, but it should identify those that materially affect interpretation. When evidence supports only a restricted claim, the claim should remain restricted.

Partiality also motivates triangulation without turning triangulation into automatic confirmation. Different evidence sources can compensate for different blind spots. Administrative data may establish distributional patterns; interviews can identify mechanisms or meanings absent from records; archival sources can reconstruct institutional change; ethnography can reveal enactment; experiments can isolate effects under constrained conditions; computational traces can show large-scale patterns. Agreement among these sources can strengthen confidence, while disagreement can reveal that they are observing different layers of the process.

GRE therefore treats observability as part of the economic and institutional environment. What becomes observable can itself be shaped by law, technology, organizational incentives, classification systems, and power. Some actors can make their activities legible while others remain invisible; some institutions can require reporting; some platforms can monopolize data; some harms appear only after measurement categories are created. Observation is consequently both an epistemic relation and, in many settings, an object of economic analysis.

3.11.3 Distinction between Relation and Representation

GRE distinguishes the relations under study from the representations through which those relations become analytically accessible. A representation can be a variable, category, graph, matrix, equation, narrative, map, model, legal classification, accounting entry, database schema, or visual diagram. Each representation selects and organizes features of a target domain. None should be treated as identical to the relation merely because it is useful for describing it.

This distinction is fundamental to relational inquiry because representations can create an appearance of precision that exceeds their empirical warrant. A network edge can encode communication, ownership, authority, trust, exchange, co-membership, or inferred association. Two edges of identical graphical form can represent substantively different relations. A weight attached to an edge may record frequency, monetary value, probability, distance, or a model-derived score. The mathematical object is therefore interpretable only through the measurement and theoretical decisions that produced it.

The same issue appears in categorical and institutional representations. A legal category can stabilize a relation for governance without exhausting its social meaning. An accounting classification can make a form of value visible while excluding others. A survey category can facilitate comparison while compressing heterogeneous experiences. An algorithmic score can summarize observed correlates while becoming institutionally consequential through decisions made on its basis. Representation can therefore both describe relations and participate in their transformation.

GRE consequently requires researchers to specify the mapping between representation and target. If “trust” is represented by repeated cooperation, the inferential gap should be stated. If “power” is represented by network centrality, the mechanism connecting centrality to power must be argued rather than assumed. If a latent variable is used to summarize capability, the construction and interpretation of that

variable should remain visible. If text embeddings represent semantic similarity, similarity in the model space should not automatically be equated with shared meaning among subjects.

This distinction also protects formal analysis from reification. A model can derive properties of a representation with complete mathematical rigor while leaving open whether the represented mechanism is empirically operative. Computational sophistication cannot bridge that gap by itself. A simulation result is a consequence of a model and its parameterization. It becomes evidence about an empirical target only through validation, calibration, comparison, and argument connecting the representation to observed processes.

Representations can nevertheless become economically real in a second sense: actors may respond to them. Credit scores, rankings, performance indicators, ratings, risk categories, forecasts, and accounting metrics can alter behavior and resource allocation. The fact that a representation becomes causally consequential does not erase the distinction between representation and relation; it creates an additional relation in which the representation enters the system it describes. GRE should then study both its descriptive adequacy and its performative effects.

Maintaining this distinction enables stronger rather than weaker modeling. It allows researchers to use abstraction aggressively while keeping track of what has been abstracted. A representation can be deliberately narrow if the local question is narrow. The epistemic requirement is transparency concerning what the representation contains, what it excludes, how it was constructed, and which claims can legitimately be inferred from it.

3.11.4 Explicit Boundary and Scale Selection

Every GRE inquiry selects a boundary and scale. The selection determines which entities, relations, periods, jurisdictions, infrastructures, ecological conditions, and forms of value enter the analysis. Because GRE often studies effects that propagate beyond administrative recipients or immediate transactions, boundary selection is an epistemic decision with direct consequences for what can be observed and explained.

A boundary is never justified merely by being available in the data. Firm-level data encourage a firm boundary; household surveys encourage a household boundary; national statistics encourage a national boundary. These sources can be appropriate, but the research question may require a different relational domain. A wage change can affect households, local demand, public revenue, migration, or subcontracting. A technological intervention can change organizational workflows, professional identities, educational demand, and infrastructural dependence. An ecological extraction can produce effects beyond the jurisdiction in which economic value is recorded. The boundary should therefore be selected in relation to the mechanism under investigation.

Scale selection poses a related problem. The individual, organization, community, institution, ecosystem, and transnational system are not simply nested containers with fixed causal priority. A process that appears exogenous at one scale can become endogenous at another. An organizational rule can constrain an individual while being generated by industry regulation, professional norms, or platform infrastructure.

A national policy can appear autonomous until cross-border capital, legal regimes, or supply chains are included. GRE requires the researcher to state which scale is analytically primary and which cross-scale effects are being omitted or modeled.

Explicit selection does not require maximal expansion. The widest possible system boundary is rarely the most useful. Expanding a model can reduce identification, tractability, interpretability, or evidential quality. A bounded inquiry can be superior when the excluded relations are unlikely to alter the conclusion materially. GRE therefore favors justified boundaries rather than maximal boundaries. The researcher should explain why the chosen domain is sufficient for the claim and identify plausible pathways through which excluded relations could matter.

Temporal boundaries require equal attention. A programme evaluated after six months may appear successful while longer-term dependency, capability formation, institutional learning, or ecological cost remains unobserved. Conversely, a long historical window can obscure short-run mechanisms by aggregating distinct institutional regimes. The relevant temporal scale depends on the generation process being studied. Some effects are immediate; others emerge through accumulation, threshold crossing, learning, reproduction, or delayed conversion.

Boundary and scale choices can themselves be politically consequential. Administrative categories define who counts as a beneficiary, employee, resident, household member, owner, victim, or stakeholder. Jurisdictional boundaries determine which costs enter public accounting. Corporate boundaries can externalize labor or ecological relations into subcontracting and supply chains. GRE therefore examines not only the researcher's boundary but also the boundaries through which economic actors and institutions organize responsibility and visibility.

The epistemic commitment is straightforward: boundary and scale should be stated, defended, and revisable. Where conclusions are sensitive to alternative boundaries, that sensitivity is part of the result. A claim that survives reasonable changes in scale has different epistemic status from one that depends on a narrow administrative frame. GRE treats this sensitivity as informative rather than embarrassing because it reveals where economic descriptions are relationally contingent.

3.11.5 Mechanism before Unwarranted Attribution

GRE is interested in generation, propagation, conversion, subject formation, power, orientation, and structural transformation. These concepts can become excessively expansive if they are used to attribute every downstream difference to an initial relation. The fifth epistemic commitment therefore requires mechanism before unwarranted attribution. A relational association or temporal sequence becomes a generative claim only when the study provides a defensible account of how the earlier configuration contributed to the later one.

Mechanism can take different forms. It may involve incentives, authority, learning, information, legal recognition, technological affordances, resource transfer, network diffusion, social interpretation, institutional reproduction, ecological feedback, or strategic adaptation. The relevant mechanism can be probabilistic rather than deterministic and can operate jointly with other causes. GRE does not require a single universal mechanism of generation. It requires the mechanism invoked in a partic-

ular explanation to be specified sufficiently that evidence could distinguish it from plausible alternatives.

This standard is especially important for relational language. A relation between two actors does not automatically explain an outcome merely because the actors are connected. Network position, for example, can matter through access to information, bargaining leverage, reputational visibility, control of brokerage, exposure to contagion, or institutional authority. Different mechanisms can produce similar network patterns. A claim about the economic significance of structure therefore requires more than descriptive topology.

The same discipline applies to power. Persistent asymmetry is relevant to power, but asymmetry alone does not establish the mechanism through which one actor constrains another's options, shapes rules, controls resources, determines classifications, or alters future generative conditions. GRE should identify how asymmetry becomes actionable. Ownership rights, legal authority, infrastructure dependence, agenda control, data access, financial leverage, or control over recognition may provide such mechanisms. Where the pathway remains uncertain, the claim should be framed as a hypothesis rather than a conclusion.

Mechanism also disciplines claims about value conversion. If educational participation is said to generate social capital, which interactions produce continuing relations? If trust is said to generate economic cooperation, what institutional or experiential processes stabilize expectations? If cultural recognition is said to improve economic capability, through which access, motivation, legitimacy, or network pathways does the conversion occur? Naming the initial and final categories is insufficient; the transformation between them is the object that requires explanation.

This commitment does not imply that every GRE study must identify a complete micro-mechanism. Some phenomena are best explained at organizational, institutional, or ecological scales. A legal rule can have a causal effect without being reduced to individual psychology. A market design can alter incentives without reconstructing every subjective deliberation. Mechanistic adequacy is scale-relative. The requirement is that the explanatory link be more specific than a retrospective association and that the proposed pathway fit the level at which the claim is made.

Mechanism before attribution also protects normative analysis. Harm should not be assigned to a particular actor or intervention merely because the harm occurred within a broader relational system. Responsibility can be distributed, mediated, historically inherited, or structurally reproduced. Normative attribution may therefore require a separate analysis of control, foreseeability, benefit, capacity, institutional role, and available alternatives. GRE's relational orientation expands the field of possible responsibility while simultaneously requiring greater care in attributing it.

3.11.6 Historical and Contextual Dependence

GRE treats economic categories, mechanisms, and regularities as potentially dependent on historical and institutional context. This commitment follows from the earlier chapters' emphasis on changing productive relations, subject forms, technologies, norms, legal categories, and value structures. A relation that operates in one institutional environment may change meaning or effect in another. Historical and

contextual dependence therefore constrains generalization without eliminating the possibility of general knowledge.

Context dependence can enter through mechanisms. Credit can expand productive capacity in one institutional setting and reinforce dependence in another. Informal networks can provide resilience where formal systems are weak while reproducing exclusion where membership is restrictive. Algorithmic evaluation can reduce some forms of discretion while creating new informational asymmetries and dependencies. A cooperative structure can enable collective control under supportive legal and financial conditions yet remain marginal under a regime that withholds access to capital or procurement. The nominal form of a relation therefore does not uniquely determine its generative effects.

Historical dependence also affects categories. The economic meaning of "worker," "firm," "household," "property," "skill," "platform," or "currency" is shaped by institutional arrangements that change over time. A category can retain its name while the relations that constitute it transform. GRE should therefore avoid treating administrative continuity as proof of substantive continuity. Historical reconstruction can be necessary even when contemporary data appear precise.

The commitment does not require every proposition to be historically unique. Recurrent mechanisms can be identified across cases, and comparative analysis can reveal robust patterns. The epistemic task is to specify the domain of portability. A mechanism may generalize across institutional settings under identifiable conditions; a formal model may describe a family of processes; a causal effect may transport when relevant effect modifiers are sufficiently similar. GRE therefore distinguishes universalizing language from conditional generalization.

Context dependence also concerns meaning. Economic actors interpret rules, resources, risks, and opportunities through historically situated symbolic and normative frameworks. The same monetary transfer can signify compensation, obligation, charity, recognition, debt, or entitlement in different settings, with different relational consequences. Interpretive evidence can therefore be necessary when the mechanism depends on how actors understand the relation.

The historical commitment extends to the researcher's categories and methods. Measures calibrated in one period can lose validity as institutions change. A proxy for employment stability can fail when contractual forms transform. A model of media attention can become obsolete after a platform redesign. A measure of technological capability can change meaning as complementary infrastructures diffuse. GRE should treat measurement regimes as historically situated rather than assume that a stable variable label guarantees stable construct validity.

This commitment encourages temporal comparison and repeated evaluation. A finding can be valid for the period studied and later require revision because the object changed. Such revision does not necessarily invalidate the earlier research; it can reveal the historical conditions under which the earlier claim held. GRE therefore regards the temporal domain of a claim as part of its specification.

3.11.7 Methodological Pluralism

Methodological pluralism is an epistemic commitment because no single method has privileged access to every aspect of a generative relational process. Quantitative estimation, qualitative interpretation, historical reconstruction, formal modeling, computational simulation, comparative analysis, experiments, ethnography, archival work, network analysis, and participatory methods each make some features more visible and others less so. GRE therefore treats methods as differentiated instruments of inquiry whose adequacy depends on the claim being made.

Pluralism differs from methodological eclecticism without standards. The presence of several methods does not strengthen a study automatically. Each method must contribute an identifiable epistemic function. A qualitative study can identify mechanisms and meanings that guide quantitative measurement. A quantitative design can estimate the distribution or magnitude of an effect suggested by qualitative evidence. Historical analysis can reveal institutional transitions that make a cross-sectional association intelligible. Formal modeling can clarify whether a proposed mechanism is internally coherent. Simulation can explore trajectories under specified assumptions. Their combination is valuable when the outputs constrain or inform one another.

Pluralism also means that methodological disagreement can be productive. If administrative data indicate improved employment while interviews reveal increased insecurity, the discrepancy may reflect different populations, time horizons, definitions, or dimensions of the outcome. GRE should investigate the divergence rather than force immediate convergence. Different methods can reveal multiple aspects of a heterogeneous value structure or relational configuration.

No hierarchy follows automatically from formal precision. Mathematical and computational methods can make assumptions explicit, derive implications, and handle complexity that prose alone cannot. Their precision concerns the representation once specified. Empirical relevance still depends on the quality of the mapping between model and target. Conversely, qualitative richness does not eliminate the need for disciplined inference. Interpretive accounts require transparent evidence, plausible alternatives, and attention to scope. Historical narratives require source criticism. Normative arguments require defensible premises. Methodological pluralism therefore expands the repertoire of rigor rather than relaxing it.

The commitment also preserves compatibility with established economics. GRE does not require replacing econometrics, experiments, equilibrium analysis, mechanism design, industrial organization, public economics, labor economics, or other established approaches when they answer the relevant question well. A GRE inquiry can incorporate these methods and add relational or generative analysis where it materially changes explanation. Pluralism includes the possibility that the best answer to a bounded question is supplied by an existing method without specifically GRE additions.

Pluralism has institutional implications for research design. Data infrastructures, publication norms, disciplinary training, and funding systems often privilege some evidence types over others. A research programme that studies heterogeneous relational processes must resist converting institutional convenience into epistemic hi-

erarchy. This does not mean every project must be interdisciplinary. It means that exclusions among methods should be justified by the question rather than inherited uncritically from disciplinary boundaries.

The strongest form of methodological pluralism in GRE is mutual corrigibility. Formal models can expose ambiguity in conceptual claims. Historical evidence can show that apparently universal categories are contingent. Qualitative evidence can reveal omitted mechanisms. Causal designs can challenge compelling narratives. Computational models can test whether proposed local rules produce the claimed system-level pattern. Normative analysis can reveal that an empirically efficient intervention depends on contested evaluative premises. Methods become part of a common research programme when they can correct one another without being forced into a single epistemology.

3.11.8 Revisability of Analytical Categories

GRE treats its analytical categories as revisable. Relation, subject, value, capacity, institution, field, constraint, trajectory, generativity, and power are working concepts whose definitions should become more precise through research. The commitment to revisability follows from ontological suspension and historical dependence: if the objects of inquiry can change and if different representations disclose different aspects of them, then the vocabulary of the research programme cannot be permanently fixed at its founding stage.

Revisability does not imply conceptual looseness. A study should define its categories precisely enough to support inference. The revision occurs when evidence, theoretical contradiction, cross-case comparison, or improved formalization shows that the existing category fails. The relevant distinction is between local precision and global finality. GRE can use a precise operational definition while remaining open to revising that definition in later research.

Category revision can take several forms. A category can be subdivided when previously hidden heterogeneity becomes important. Several categories can be combined when distinctions prove analytically unproductive. Boundaries can change when new relations become visible. A category can move from exogenous condition to endogenous object of inquiry. A variable treated as an attribute can be reconceptualized as relationally generated. A representation can be abandoned if it systematically misclassifies the phenomenon.

Economic subjecthood provides one example. A research programme built exclusively around human individuals would be strained by organizations, automated systems, collective entities, or hybrid arrangements that make economically consequential selections. Expanding the category of operational economic subject can improve analysis, but that revision need not erase distinctions concerning consciousness, personhood, legal standing, or moral status. Revisability allows the category to change while preserving distinctions that remain normatively or empirically necessary.

Value provides another example. Price can remain a central economic representation of value without exhausting the relevant evaluative or relational phenomena. Research can discover forms of value whose realization depends on access, recognition, participation, ecological capacity, institutional continuity, or future capability.

Revising the analytical vocabulary to capture these forms does not require treating them as commensurable or collapsing them into a single metric.

Revisability also applies to GRE itself. Concepts introduced in this book are provisional elements of a research programme rather than protected doctrine. Later empirical work may show that some distinctions are unproductive, that other concepts are missing, or that the framework overstates the usefulness of generative analysis in particular domains. A research programme becomes cumulative not by preserving every founding category but by creating procedures through which categories can be criticized, compared, refined, and replaced.

This commitment places a burden on documentation. When categories change across studies or over time, researchers should record how definitions differ and why. Conceptual drift can otherwise appear as empirical change. GRE therefore favors transparent conceptual provenance: the history of a category's operationalization is part of the knowledge needed to compare results.

3.11.9 Epistemic Humility

Epistemic humility is the concluding commitment because it governs the relation among all the preceding ones. It requires the strength, scope, and precision of a claim to remain proportionate to the evidence and argument that support it. Humility does not require weak conclusions where strong conclusions are justified. It requires researchers to distinguish what has been observed from what has been inferred, what has been modeled from what has been validated, what is locally supported from what is generalized, and what is normatively defended from what is empirically established.

In relational economic inquiry, overstatement can arise easily because the studied systems are interconnected. Once a downstream effect is observed, it is tempting to narrate a complete chain of generation. Once a network pattern appears, it is tempting to attribute power or influence. Once a simulation reproduces a stylized fact, it is tempting to treat the mechanism as confirmed. Once an intervention succeeds locally, it is tempting to generalize it across contexts. Epistemic humility interrupts these moves by requiring an explicit account of the inferential bridge.

Humility also concerns uncertainty that cannot be reduced to a probability estimate. Researchers can face model uncertainty, category uncertainty, boundary uncertainty, interpretive disagreement, historical incompleteness, unknown unknowns, or normative pluralism. Quantification is valuable when a defensible probability model exists, but not every epistemic limitation is probabilistic. GRE therefore permits qualitative statements of uncertainty where numerical precision would be misleading.

The commitment is especially important for intervention. Application-dominant praxis often requires action before knowledge is complete. Epistemic humility does not imply inaction under uncertainty. It changes how intervention is designed: assumptions are made explicit, monitoring is built in, reversible steps are preferred where feasible, affected subjects retain opportunities for contestation, and the intervention is treated as a source of new evidence rather than the execution of a final truth. Learning and governance become coupled.

Humility also requires attention to the distribution of epistemic authority. Researchers, administrators, firms, communities, workers, users, and affected populations can possess different forms of knowledge. Expertise can be real without being total. Local experience can identify mechanisms invisible to aggregate data while remaining limited in scope. Institutional actors can possess operational information while having incentives to frame it selectively. GRE therefore treats disagreement among knowledge holders as an object for analysis rather than assuming that one standpoint has automatic priority across all questions.

This commitment extends to artificial and computational systems. Large models, automated inference, and high-dimensional data can increase the scale and speed of analysis, but they do not eliminate uncertainty concerning data generation, representation, causal identification, normative criteria, or institutional effects. Computational confidence can be numerically precise while remaining epistemically narrow. GRE should therefore distinguish predictive performance from explanatory adequacy, statistical calibration from normative legitimacy, and representational capacity from knowledge of the target process.

Epistemic humility finally concerns the research programme's own historical position. GRE is being constituted under particular contemporary conditions: changing productive relations, computational abundance, new forms of artificial capability, ecological constraints, institutional complexity, and increasing visibility of relational and generative processes. These conditions make the programme plausible and potentially useful; they do not guarantee its enduring adequacy. Future economic forms may require different concepts. Existing theories may explain domains where GRE adds little. Evidence may contradict central hypotheses. The programme should be organized so that such correction is possible without treating revision as failure.

Taken together, the commitments of this section define a disciplined epistemic posture for Generative Relational Economics. GRE can make strong claims, employ sophisticated formalisms, combine diverse evidence, and participate in intervention, but it should do so while suspending unnecessary ontological conclusions, acknowledging partial observation, separating relations from their representations, making boundaries and scales explicit, demanding mechanisms for attribution, locating claims historically, preserving methodological pluralism, revising categories when required, and calibrating confidence to warrant. These commitments prepare the transition from inquiry to praxis. The following section turns to how GRE moves from explanation and evaluation toward relational diagnosis, generative diagnosis, and intervention under conditions where knowledge remains necessarily incomplete.

3.12 Praxis in Generative Relational Economics

The preceding sections established the objects, scales, questions, analytical perspective, modes of inquiry, and epistemic commitments of Generative Relational Economics. Those elements define how GRE can study economic relations, but a research programme concerned with generative conditions also requires an account of how inquiry can enter practice. The role of this section is to specify a preliminary praxis architecture for GRE: a disciplined way of moving from explanation toward interven-

tion while preserving the epistemic restraints developed above. Its objective is not to provide a universal policy cycle or a general theory of governance. It identifies a recurrent sequence of practical operations through which relational and generative knowledge can inform action under conditions of incomplete knowledge, heterogeneous values, changing environments, and effects that propagate beyond the administratively designated recipient.

GRE praxis begins from a distinction between understanding a system and acting within it. Explanation can identify mechanisms, constraints, distributions, histories, and relational structures, yet intervention changes the very configuration that explanation describes. An intervention can redistribute resources, alter expectations, create or dissolve relations, redefine institutional categories, shift bargaining positions, generate new dependencies, reorganize attention, and modify later capacities for action. Praxis therefore cannot be represented as the simple application of a finished model to a passive target. It is an entry into an evolving relational domain in which the intervention, the affected subjects, the environment, and the relevant knowledge can all change through their interaction.

For that reason, the praxis architecture developed here is iterative. It moves through relational diagnosis, generative diagnosis, identification of constraints and enabling conditions, intervention design, allocation understood as relational intervention, tracing of downstream effects, feedback and revision, adaptive governance, and, where required, withdrawal, reversal, or repair. These operations can overlap, recur, or be entered from different points. They are not a mandatory sequence imposed on every practical problem. Their function is to prevent a narrow intervention logic in which resources are allocated, an immediate output is measured, and wider changes are treated as externalities unless they happen to fit the original administrative frame.

The praxis perspective also preserves the distinction between research-dominant and application-dominant activity. Research-dominant praxis principally seeks improved understanding, even when research design itself changes the studied field. Application-dominant praxis principally seeks to alter an economic or institutional situation under practical constraints. The difference concerns orientation rather than an absolute separation between knowledge and action. Research can generate interventions, and interventions can generate knowledge. GRE therefore treats praxis as a domain in which explanation, evaluation, experimentation, governance, and learning become coupled while remaining analytically distinguishable.

A further constraint is normative. Generativity is not itself a sufficient criterion of success. An intervention can generate economic activity while deepening dependence, produce capabilities for one group while foreclosing possibilities for another, increase circulation while accelerating extraction, or create institutional stability by suppressing exit and contestation. Section 3.12 therefore develops the architecture of intervention without resolving the normative standards by which generated consequences should be judged. Those standards are taken up in the following section. Here the central concern is more basic: how GRE can intervene without treating either the target of intervention or the intervention's own consequences as fixed in advance.

3.12.1 From Explanation to Intervention

The movement from explanation to intervention is a change in epistemic and practical burden. Explanatory inquiry asks what relations, mechanisms, histories, and conditions contributed to an observed pattern. Intervention asks what may happen if some part of that configuration is deliberately altered. The second question contains the first but adds counterfactual, organizational, ethical, and temporal demands. A mechanism that explains a past outcome may not remain invariant after actors learn about the intervention, institutions adapt, or the distribution of resources changes. GRE therefore resists the assumption that an explanatory model can be converted directly into a policy instrument without re-examining the relations through which the intervention will operate.

A practical intervention enters a field already structured by prior relations. Subsidizing a household, financing a firm, redesigning a public service, opening access to data, changing a legal entitlement, or introducing an artificial system does more than modify one variable. It can alter who interacts with whom, which claims become enforceable, which actions become feasible, whose knowledge becomes authoritative, and which future trajectories become easier to sustain. The intervention should therefore be represented not only by its administrative action but also by the relational changes through which its consequences may be mediated.

This perspective changes the meaning of implementation. Implementation is often treated as the stage in which a previously selected intervention is executed with fidelity. GRE instead treats implementation as an epistemically productive period in which assumptions about relations, mechanisms, and capacities encounter an evolving empirical configuration. Deviations from the original design can indicate administrative failure, but they can also reveal that the initial model omitted relevant actors, constraints, interpretations, or feedback mechanisms. Praxis requires distinguishing avoidable execution error from informative evidence that the intervention theory requires revision.

The transition from explanation to intervention also introduces strategic interaction. Subjects can anticipate policy, resist classification, exploit new opportunities, reorganize coalitions, change reporting behavior, or redirect resources. Organizations can internalize an intervention into routines that differ from its stated purpose. Platforms can redesign interfaces in response to regulation. Beneficiaries can combine an allocation with household, community, or informal resources in ways that produce unanticipated effects. These responses are part of the relational system rather than noise surrounding an otherwise fixed treatment.

GRE therefore favors interventions whose theory of change states at least four elements. First, it identifies the relevant relations through which the intervention is expected to operate. Second, it specifies the generative claim: what capacities, structures, opportunities, constraints, or forms of value are expected to emerge or transform. Third, it states the anticipated temporal and scalar pathways through which effects may propagate. Fourth, it identifies observations that would count against the intervention theory. The resulting design remains provisional, but its provisionality is disciplined rather than vague.

Intervention under uncertainty does not imply paralysis. Many economic and gov-

ernance problems require action before the relational system is fully known. The practical question is how to make action compatible with learning. GRE therefore gives special weight to staged implementation, monitoring, contestability, modularity, reversible components, and explicit review points where feasible. These features do not eliminate uncertainty. They reduce the cost of discovering that the intervention has altered the field in ways the initial explanation did not anticipate.

3.12.2 Relational Diagnosis

Relational diagnosis identifies the configuration within which the practical problem is constituted. Its purpose is not to produce an exhaustive map of all social relations. It asks which relations are materially relevant to the problem, how they are organized, which boundaries have been selected, and where the apparent administrative object depends on actors or conditions outside that boundary. Diagnosis therefore precedes intervention design because the same nominal problem can require different action when its relational constitution differs.

A relational diagnosis begins by identifying the subjects, organizations, institutions, infrastructures, symbolic systems, and ecological conditions that participate in the relevant economic situation. It then asks how access, authority, recognition, information, resources, obligations, and opportunities are distributed among them. The resulting map may be qualitative, quantitative, historical, network-based, institutional, or mixed. Its adequacy depends on whether it reveals relations that are necessary to understand the practical problem rather than on whether it maximizes representational complexity.

Consider a programme intended to improve employment access. An administrative diagnosis might begin with unemployed individuals and available jobs. A relational diagnosis can reveal additional mechanisms: transportation, childcare, credential recognition, social networks, disability access, hiring intermediaries, platform ranking, visa status, household obligations, employer risk practices, or regional housing costs. These are not automatically the correct variables in every case. Their relevance depends on whether they mediate the conversion of an employment opportunity into an actual capability to obtain and sustain work.

Relational diagnosis also identifies asymmetry. The relevant question is not only who possesses more resources, but which actors can define categories, set terms of exchange, control infrastructures, impose switching costs, delay decisions, externalize risk, or withdraw without comparable loss. Two actors may exchange voluntarily while facing highly unequal exit conditions. A platform and a small supplier may both be organizations, yet their capacity to redesign the interaction can differ drastically. Diagnosing these asymmetries matters because an intervention that treats formally similar actors as substantively equivalent can reproduce the mechanism that generated the problem.

The diagnosis should also be historical. Present relations can depend on prior institutional settlements, accumulated debts, inherited infrastructures, past exclusions, or sequences of investment that make current alternatives unequally costly. A cross-sectional map can show who is connected to whom while missing why the relation has its present form or why some apparently available alternatives are prac-

tically inaccessible. Historical reconstruction helps distinguish a relation that is contingent and readily modifiable from one stabilized by layered commitments and path-dependent investments.

The output of relational diagnosis is therefore a bounded working representation of the practical field. It should make its exclusions visible. No map captures every relation, and an attempt to include everything can make intervention impossible. GRE instead requires an explicit statement of which relations are treated as inside the diagnostic boundary, which are treated as environmental conditions, and which remain uncertain. The map is revisable as intervention reveals previously hidden dependencies.

3.12.3 Generative Diagnosis

Relational diagnosis identifies the configuration; generative diagnosis asks what that configuration tends to produce. The distinction matters because the same relational structure can be significant for different reasons depending on the processes it sustains. A credit relation can generate productive capacity, dependency, reputational effects, data, bargaining power, future borrowing opportunities, or combinations of these. A school can distribute instruction while also generating networks, credentials, expectations, classifications, and future access. A platform can facilitate exchange while generating information asymmetries, behavioral dependence, market visibility, or new organizational capabilities.

Generative diagnosis therefore focuses on transformations rather than only states. It asks what changes because a relation persists, intensifies, weakens, or is removed. The relevant outcomes can include resources, capacities, identities, institutional routines, legal positions, expectations, symbolic categories, ecological conditions, or the ability to enter later relations. This focus is particularly important when immediate outputs are poor proxies for longer-horizon consequences. A grant may be fully disbursed while failing to produce the organizational capacity it was intended to support. A training programme may improve measured skills while weakening participation because the credential is not institutionally recognized. A subsidy may increase adoption while entrenching dependence on a proprietary infrastructure.

The generative diagnosis should distinguish several pathways. Some effects arise directly from the intervention target. Others are mediated through relations with third parties. Some emerge from feedback: an initial change alters behavior, which changes the environment faced by later participants. Some effects accumulate only after repeated interactions. Others occur through symbolic or classificatory change, where being recognized as eligible, risky, employable, innovative, or compliant modifies later treatment by institutions.

Generative diagnosis also asks what is reproduced. A relational configuration may produce no dramatic new outcome while continually regenerating a distribution of advantage, vulnerability, or access. Stable inequality can be generative in this sense because institutions repeatedly convert initial asymmetries into later opportunities. Conversely, a relation can sustain capabilities that would deteriorate if the relation disappeared. Maintenance, reproduction, and repair are therefore forms of generation when they preserve conditions that require continuing relational work.

A further question concerns foreclosure. Generation can expand possibilities for some actors while reducing the future option set for others or for the same actors at a later time. Infrastructure investment can enable activity while creating technological lock-in. Debt can finance capacity while narrowing future discretion. Standardization can reduce coordination costs while suppressing alternative forms of practice. Generative diagnosis therefore traces both enabling and constraining transformations without assuming that generation is uniformly expansive.

The practical output of generative diagnosis is a set of plausible mechanism pathways linking the relational configuration to changes that matter for the intervention. These pathways can be compared, tested, revised, or ranked by evidential support. GRE does not require every pathway to be fully identified before action. It requires the intervention to state what it expects to generate and why, so that later observations can update rather than merely decorate the original theory.

3.12.4 Identification of Constraints and Enabling Conditions

Diagnosis becomes actionable when it identifies conditions that limit or enable transformation. GRE uses constraint in a broad but disciplined sense: a constraint changes the set, cost, probability, or viability of available transformations without necessarily making an action logically impossible. Enabling conditions operate in the opposite direction by making some transformations more feasible, durable, or accessible. The same condition can constrain one pathway while enabling another.

Constraints can be material, institutional, relational, informational, temporal, symbolic, ecological, or cognitive. A lack of capital is a material constraint, but the ability to use capital may depend on licenses, trusted partners, language access, data, infrastructure, or the timing of payments. A legal entitlement can exist while remaining practically inaccessible because procedural complexity, documentation requirements, or fear of institutional contact limits its use. An organization can possess technical capacity while lacking the authority to deploy it. A community can possess knowledge while lacking channels through which institutions recognize that knowledge as actionable.

The distinction between constraint and symptom is central. Low participation can be treated as a behavioral problem and addressed through incentives, yet the underlying constraint may be timing, distrust, inaccessible procedures, reputational risk, or exclusion from the networks through which information circulates. Raising an incentive can improve participation while leaving the deeper constraint unchanged, or it can worsen inequality if only already advantaged actors can respond. Constraint identification therefore asks which conditions actually regulate the transformation pathway relevant to the intervention.

Enabling conditions deserve equal analytical attention. Praxis often becomes overly problem-centered and maps only deficits. Existing trust relations, local organizations, informal knowledge, public infrastructure, legal protections, professional norms, ecological capacities, and mutual-aid practices can already support generation. An intervention that ignores these conditions can displace them with a formal system that appears more legible while being less generatively capable. GRE therefore asks which existing relations should be preserved, strengthened, connected, or

left undisturbed.

Constraints and enabling conditions are also scale-relative. A national regulation can constrain an organization while enabling fairer competition across a sector. A household norm can constrain an individual's labor-market participation while enabling care provision that sustains other members. A standardized protocol can constrain local discretion while enabling interoperability. Praxis requires representing these tensions rather than declaring a condition simply enabling or constraining in the abstract.

The identification process should therefore produce intervention points rather than a flat inventory. Some constraints are proximal and modifiable; others are structural conditions that cannot be changed within the intervention horizon. Some enabling conditions can be activated with modest resources; others require institutional reform. Distinguishing these categories helps prevent designs that target visible but weakly generative variables while leaving the mechanisms of exclusion or capacity formation intact.

3.12.5 Intervention Design

Intervention design translates diagnosis into a provisional configuration of actions, resources, institutions, and learning procedures. GRE does not require a distinctive policy instrument. Taxes, transfers, public investment, regulation, organizational redesign, information provision, infrastructure, standards, cooperative arrangements, educational programmes, platform rules, procurement, or combinations of these can all be compatible with GRE. What distinguishes the praxis perspective is how the intervention is specified: in relation to mechanisms, downstream generation, scale, feedback, and revisability.

A GRE intervention should first identify its operative target. The target can be a resource constraint, a relation, a conversion mechanism, an institutional rule, a boundary, a feedback loop, an information structure, or an enabling condition. Target clarity matters because interventions with the same administrative recipient can act through different mechanisms. A cash transfer and a childcare service may both support household economic participation, but they alter different constraints and relational structures. Their effects should not be inferred from the shared identity of the recipient.

Second, intervention design should distinguish the intended immediate change from the intended generative effect. Providing equipment is an immediate allocation. Developing a durable productive capacity may be the generative objective. Changing a regulation is an immediate institutional act. Increasing entry, reducing dependency, or enabling new organizational forms may be the intended downstream effect. This distinction makes it possible to observe successful implementation together with failed generation, or imperfect implementation together with unexpected generative benefits.

Third, design should state relevant temporal horizons. Some interventions seek rapid stabilization; others seek capacity formation whose effects appear slowly. A short evaluation window can misclassify a long-horizon intervention as ineffective or reward interventions that produce immediate outputs by drawing down future re-

sources. GRE therefore encourages explicit differentiation among immediate, intermediate, and longer-horizon effects without assuming that longer is always better.

Fourth, intervention design should anticipate heterogeneity. Subjects differ in resources, vulnerabilities, interpretation, institutional status, and ability to convert an allocation into later capacity. Uniform provision can therefore generate unequal outcomes. The design question is not necessarily to individualize every intervention, which can become administratively costly or intrusive. It is to identify forms of heterogeneity that are mechanism-relevant and to determine whether adaptive, tiered, or plural pathways are needed.

Fifth, design should include learning architecture. Monitoring variables, qualitative feedback, review intervals, stop conditions, and procedures for incorporating affected participants should be established before implementation where possible. This prevents evaluation from becoming an after-the-fact search for favorable indicators. It also recognizes that some of the most important effects may be discovered only after the intervention enters the field.

Intervention design in GRE is therefore closer to constructing a revisable relational hypothesis than to selecting a fixed treatment. The design states what is being changed, through which relations, toward which generative effects, under which assumptions, across which scales and time horizons, and with what procedures for detecting error. The resulting intervention can still be administratively simple. Analytical sophistication does not require operational complexity when the mechanism is clear.

3.12.6 Allocation as Relational Intervention

Allocation is a central economic operation, but GRE treats allocation as the beginning of a relational process rather than its endpoint. Money, time, attention, infrastructure, rights, data access, institutional recognition, expertise, or productive assets enter existing relations when allocated. Their consequences depend on conversion conditions, obligations, expectations, complementary resources, and the position of the recipient within wider structures.

This perspective changes the unit of practical analysis. A transfer to an individual may affect a household, landlord, creditor, employer, local market, or platform through expenditure, bargaining, debt repayment, mobility, or information. Funding an organization can change its internal authority, external partnerships, reputational standing, and future ability to attract resources. Granting data access can create research capacity while redistributing informational advantage. Allocation therefore changes relations even when the formal instrument is directed to a discrete recipient.

Relational allocation does not mean that every allocation must be socially conditioned or collectively administered. Direct individual transfers can be valuable precisely because they reduce dependence on gatekeepers. The analytical point is that the intervention should ask what relations the allocation enters or transforms. An unconditional transfer can weaken a coercive relation by increasing exit capacity. A conditional transfer can create a new monitoring relation. A loan can expand productive capacity while strengthening a creditor's claims. The relational effects depend on design and context rather than on the category of instrument alone.

Allocation also has temporal structure. Resources can be consumed, invested, circulated, pooled, converted, or used to maintain existing capacities. Timing can determine which pathway becomes viable. A delayed payment can destroy a fragile organization even if the total allocation is adequate. A predictable stream can generate planning capacity beyond its nominal monetary value. A one-time grant can enable experimentation but fail to sustain maintenance. GRE therefore treats schedule, predictability, reversibility, and duration as properties of the allocation relation.

The recipient itself may be generated through allocation. Programmes define eligibility categories, create beneficiary identities, establish reporting obligations, and sometimes produce organizations capable of receiving funds. Public procurement can constitute firms as qualified suppliers. Credit scoring can define economically consequential categories of risk. Allocation systems therefore participate in the production of subjects and classifications, not merely in the distribution of pre-existing resources among them.

For praxis, the implication is that allocation should be evaluated through both direct transfer and relational transformation. The relevant questions include what capacity the resource creates, what dependencies accompany it, what complementary conditions are required, which actors gain authority, how value is recirculated or extracted, and what happens when the allocation stops. These questions extend ordinary allocation analysis rather than replacing it.

3.12.7 Tracing Downstream Effects

Once an intervention enters a relational field, praxis requires tracing effects beyond its immediate output. Downstream tracing follows the propagation, conversion, recirculation, dissipation, extraction, and stabilization of changes generated by the intervention. The purpose is not to attribute every later event to the intervention. It is to identify plausible pathways through which initially local changes become economically consequential elsewhere or later.

Downstream effects can be direct, mediated, recursive, or displaced. A subsidy can increase demand directly, alter supplier investment through expectation, change local prices through market response, and affect future policy through political interpretation. A new infrastructure can reduce transport costs, reorganize land values, change settlement patterns, and later alter fiscal capacity. A platform rule can affect user behavior, which changes the data used by the platform, which then changes ranking or recommendation, producing a recursive effect.

Tracing requires temporal discipline. Early indicators can differ from later effects because actors adapt and complementary investments emerge. Some harms are delayed. Some benefits require repeated interaction before they become visible. GRE therefore distinguishes outcome timing from causal distance. An effect that occurs quickly can still be relationally distant if it is mediated through several actors, while a delayed effect can arise from a simple accumulation mechanism.

Tracing also requires counterfactual restraint. Observing a later change in a connected actor does not prove that the intervention generated it. Evidence can come from experimental or quasi-experimental designs, process tracing, comparative cases, administrative sequences, qualitative testimony, network change, simulation,

or combinations of these. The method should match the claim. The broader the asserted downstream attribution, the greater the burden of distinguishing intervention effects from concurrent change.

Some downstream effects concern value conversion rather than magnitude. An allocation can be converted into political influence, social recognition, technical capacity, ecological pressure, or future access. These forms may not be commensurable with the original resource. Tracing therefore cannot always be reduced to adding monetary benefits and costs. GRE can use monetary valuation where appropriate while preserving additional dimensions when conversion into a scalar measure would erase mechanism-relevant differences.

The practical function of downstream tracing is to maintain contact between intervention and evolving reality. It provides evidence for revision, identifies beneficiaries or harmed parties omitted from the original frame, and detects when an intervention's generative pathway has changed. It also prevents a programme from declaring success solely because the administratively proximate output was delivered as planned.

3.12.8 Feedback and Revision

Feedback converts intervention into learning when observations are allowed to alter the intervention theory and design. GRE distinguishes feedback from mere monitoring. Monitoring records whether specified indicators change. Feedback becomes analytically consequential when those observations can revise assumptions about relations, mechanisms, boundaries, timing, subject heterogeneity, or normative effects.

A useful feedback architecture separates implementation evidence from generative evidence. Implementation evidence asks whether the intervention occurred as intended: funds reached recipients, infrastructure was built, a rule was applied, or a service became available. Generative evidence asks whether the intended transformations followed and what additional transformations occurred. Maintaining this distinction prevents implementation fidelity from being mistaken for substantive success.

Revision can occur at several levels. Parameters can be adjusted while the intervention theory remains intact. Delivery can change because conversion conditions differ across groups. The relational target can change when a hidden intermediary becomes visible. The generative objective itself can be revised when the original aim proves infeasible, harmful, or normatively contested. In more substantial cases, the intervention can reveal that the original problem representation was wrong and requires reconstruction.

Feedback should include affected subjects where their experience provides access to mechanisms or harms not visible in aggregate indicators. Participation is not automatically epistemically superior; local actors can disagree, possess partial information, or face incentives that shape reporting. Their knowledge nevertheless belongs to the evidential field. A feedback system that listens only to administrative data can systematically miss changes in trust, dignity, informal burden, strategic adaptation, or hidden exclusion.

Revision also requires institutional capacity. An organization can collect excellent evidence yet be unable to change because budgets, legal mandates, procurement contracts, professional incentives, or political commitments lock the intervention into its original form. GRE therefore treats the ability to revise as part of intervention design. Review authority, modular contracts, contingency funds, sunset clauses, and explicit decision rules can create practical room for learning, where appropriate.

Feedback is thus not a final stage after implementation. It is a continuing relation between action and evidence. Praxis becomes adaptive when the intervention is organized so that new information can change subsequent action without abandoning accountability or making goals infinitely movable.

3.12.9 Adaptive Governance

Adaptive governance is the institutionalization of revision under changing conditions. It becomes relevant when the intervention affects a system whose relations, actors, or environment evolve on a time scale comparable to the governance process. In such settings, a one-time optimal design can become obsolete even if it was well justified when adopted. GRE therefore treats governance as an ongoing arrangement for observing, deciding, revising, coordinating, and contesting changes in a relational field.

Adaptation does not mean continuous discretionary change. Constant revision can destroy predictability, undermine investment, and make rights dependent on administrative mood. Stable rules can themselves be enabling conditions. Adaptive governance therefore requires deciding which elements should remain stable and which should be revisable. Constitutional protections, procedural rights, or long-horizon commitments may provide a stable frame within which parameters, implementation mechanisms, or experimental components can change.

The architecture of adaptation should match the distribution of knowledge and consequence. Centralized revision can coordinate across regions and prevent local capture, while decentralized adaptation can respond to context and reveal heterogeneous mechanisms. Multi-level governance can combine these functions when authority, information, and accountability are allocated explicitly. GRE does not presume decentralization to be intrinsically more relational or generative. The relevant question is which governance structure can perceive and respond to the mechanisms that matter while preserving legitimate constraints on power.

Adaptive governance also involves threshold decisions. Some observed variation is noise; some indicates a changing mechanism. Revising too quickly can chase temporary fluctuations, while revising too slowly can entrench harm. Governance therefore needs criteria for escalation, experimentation, suspension, and review. These criteria can be quantitative, qualitative, procedural, or mixed depending on the domain.

Learning across cases is another component. Local adaptation can generate knowledge that becomes useful elsewhere, but portability requires comparison of mechanisms and boundary conditions. A successful intervention in one institutional environment may fail where trust, infrastructure, legal authority, or subject composition differs. Adaptive governance therefore builds cumulative knowledge by documenting not only whether an intervention worked, but under which relational conditions

and through which pathway.

At its strongest, adaptive governance alters its own learning capacities. Monitoring systems improve, categories are revised, participation channels change, and institutional memory accumulates. Governance thereby becomes a generative process whose output includes future ability to govern. This recursive feature is central to GRE praxis: the intervention should be evaluated partly by whether it leaves the system more capable of perceiving, contesting, and responding to later problems.

3.12.10 Withdrawal, Reversal, and Repair

A praxis architecture is incomplete if it specifies how to begin and revise interventions but not how to stop them. Withdrawal, reversal, and repair are distinct practical operations. Withdrawal ends or reduces an intervention. Reversal seeks to restore a prior condition or undo a change where feasible. Repair addresses harms, dependencies, damaged relations, or lost capacities that persist after withdrawal. GRE treats these operations as part of intervention design rather than exceptional responses to obvious failure.

Withdrawal can be required for several reasons. An intervention may fail to generate its intended effect, produce unacceptable harm, become obsolete as conditions change, or create costs that exceed its continuing value. It can also succeed so thoroughly that the intervention is no longer required. A temporary guarantee, emergency subsidy, or transitional institution should not become permanent merely because its removal was never designed.

Stopping an intervention can itself be generatively consequential. Organizations may have invested around a subsidy, households may depend on a service, communities may have reorganized around infrastructure, or markets may have adapted to a regulatory regime. Abrupt withdrawal can therefore destroy capacities that the intervention helped create. Exit design should consider notice, transition periods, transfer of responsibilities, preservation of useful infrastructure, and the distribution of adjustment costs.

Reversal is more demanding because relational change is often path dependent. Restoring a prior rule does not necessarily restore the prior system. Actors have learned, investments have shifted, expectations have changed, and some capacities may have disappeared. A policy reversal can therefore create a third configuration rather than return to the first. GRE treats reversibility as a graded property: some components can be reversed mechanically, others only approximately, and some transformations are effectively irreversible within the relevant horizon.

Repair addresses the residual consequences of intervention. It can involve compensation, restoration of access, institutional reform, rebuilding trust, data deletion or correction, ecological remediation, debt restructuring, reinstatement of rights, or support for capacities weakened by the intervention. Repair is not equivalent to monetary compensation because the harmed object may be relational, institutional, ecological, symbolic, or temporal. A payment can acknowledge loss while leaving the mechanism that produced the loss intact.

The possibility of repair also changes how interventions should be designed. Sys-

tems that preserve audit trails, appeals, modularity, data provenance, and institutional responsibility are easier to correct. Interventions that diffuse responsibility across opaque chains can make harm difficult to attribute and repair. GRE therefore treats repairability as a practical design consideration alongside effectiveness and adaptability.

Withdrawal, reversal, and repair complete the preliminary praxis cycle developed in this section. GRE moves from explanation toward intervention by diagnosing the relational field, identifying what the field generates, locating constraints and enabling conditions, designing a provisional intervention, treating allocation as a relational act, tracing downstream effects, learning through feedback, adapting governance, and retaining the capacity to stop or repair what has been created. The sequence remains heuristic rather than universal. Its purpose is to organize intervention under incomplete knowledge without reducing practice to either static optimization or unconstrained experimentation.

This praxis architecture also clarifies why evaluation cannot be postponed to a single terminal outcome. Each stage creates questions about value, harm, participation, capability, dependency, future possibility, and domination. An intervention may be operationally adaptive while normatively unacceptable, or normatively attractive in intention while generatively destructive in practice. The following section therefore turns from the architecture of action to the standards by which generated consequences can be evaluated under plural and sometimes incommensurable values.

3.13 Evaluation and Normative Orientation

Generative Relational Economics requires a normative vocabulary because the processes it studies can enlarge possibility, redistribute capacity, stabilize cooperation, create dependency, intensify domination, or foreclose alternative futures. The role of this section is to specify the evaluative dimensions through which such consequences can be examined without converting generativity itself into a moral criterion. Its objective is to distinguish descriptive claims about what an economic relation generates from normative judgments about whether the generated configuration should be sustained, revised, constrained, or repaired. The discussion proceeds through ten connected dimensions: the normative status of generativity; generated value and harm; participation; capability; relational quality; future possibility; dependency and domination; generative foreclosure; plural and incommensurable values; and the division of labor between GRE and GREthic. The method is constitutive and normative. It does not attempt to derive one complete moral theory from GRE. It identifies evaluative objects and inferential disciplines that allow GRE to remain normatively explicit while preserving plurality among competing theories of justice and ethical judgment.

The need for this distinction follows directly from the analytical architecture developed above. A relation can be highly generative in the descriptive sense because it produces new organizations, knowledge, technologies, markets, habits, classifications, capabilities, and forms of value. The same relation can distribute those consequences asymmetrically, externalize harms, narrow exit options, or reorganize the

field so that some future possibilities become inaccessible. An intervention can therefore succeed according to one generative objective while producing losses elsewhere in the relational domain. GRE evaluation must trace both kinds of consequence rather than allowing the presence of generation to function as evidence of desirability.

Normative evaluation also requires attention to temporal depth. Immediate welfare gains can be accompanied by long-run dependency. Short-term loss can sometimes create later capability. A stable relation can protect vulnerable participants while also becoming difficult to contest. An institution can increase aggregate opportunity while decreasing the range of trajectories available to a particular group. GRE therefore treats present outcome, relational position, future capacity, and transformation of possibility as analytically separable evaluative objects. Their relative importance cannot be fixed once for every inquiry.

Evaluation is also complicated by heterogeneous value. Economic decisions can affect income, security, care, recognition, ecological integrity, autonomy, knowledge, belonging, trust, aesthetic experience, institutional legitimacy, and many other forms of value whose relations are only partially commensurable. Monetary valuation can be useful within a defined problem while leaving significant evaluative remainders. GRE consequently distinguishes commensuration as an analytical or institutional operation from the stronger claim that the values being compared possess a common natural metric.

The resulting normative stance is neither value-neutrality nor normative closure. GRE accepts that economic inquiry frequently contains evaluative choices in the selection of outcomes, boundaries, scales, and affected subjects. It therefore seeks to make those choices explicit and contestable. At the same time, GRE does not treat its own analytical categories as sufficient to decide every ethical conflict. Participation, capability, relational quality, future possibility, dependency, domination, and foreclosure provide a multidimensional evaluative field. Normative judgment still requires specification of who is affected, which values are at stake, how conflicts among values are handled, and which ethical or political principles justify intervention.

This distinction creates an interface with GREthic. GRE supplies economic analysis of generative structures, distributions, dependencies, conversion pathways, and changes in future possibility. GREthic addresses the broader ethical problem of how such findings should enter judgment, justification, institutional design, and the evolution of normative criteria. Their relation is therefore collaborative without being identical. The present section establishes that interface while keeping GRE's disciplinary center within economics.

3.13.1 Normative Status of Generativity

Generativity describes a capacity of a relation, process, institution, or configuration to produce further states, capacities, relations, values, or possibilities. That descriptive property has no fixed normative sign. Productive networks, monopolistic infrastructures, extractive regimes, scientific communities, predatory markets, mutual-aid institutions, and systems of surveillance can all generate durable consequences. The fact that a configuration generates more than its immediate output identifies an important economic property; it does not establish that the resulting trajectory should

be preferred.

This distinction is foundational because GRE gives generativity an unusually prominent analytical role. Without an explicit normative separation, the vocabulary of generation could encourage a subtle bias toward expansion, novelty, proliferation, or self-reproduction. Economic history supplies many cases in which highly generative arrangements produced wealth together with coercion, ecological depletion, exclusion, or durable hierarchy. A relation can reproduce itself efficiently because the costs of exit are high. An institution can generate rapid innovation because risks are shifted toward actors with weak bargaining power. A platform can generate dense interaction while concentrating control over the infrastructure through which that interaction occurs. Descriptive generativity therefore requires an additional evaluative step.

The relevant question is not whether generation occurs, but what is generated, for whom, through which relations, under which constraints, and with what effects on later possibility. These questions prevent GRE from treating generativity as a scalar objective that can be maximized independently of content. More generation can be desirable in one dimension and damaging in another. A research system can generate knowledge while degrading working conditions. A credit system can generate entrepreneurial capacity while expanding vulnerability to debt. A welfare programme can generate security while also creating administrative classifications that constrain mobility. Evaluation therefore concerns the structure and distribution of generation.

Normative analysis must also distinguish generativity from regeneration. A system can generate novelty while eroding the material or social conditions required for continuation. Another system can maintain those conditions without producing substantial novelty. A third can restore damaged capacities while limiting some current activities. These trajectories involve different evaluative questions. GRE therefore avoids equating novelty, persistence, resilience, growth, and regeneration with one another. Each describes a different relation between current activity and future conditions.

A similar distinction applies to self-reinforcement. Some beneficial institutions require positive feedback to remain viable. Some harmful institutions also acquire self-reproducing capacities. The presence of a stable attractor-like pattern, increasing returns, or institutional persistence does not imply normative legitimacy. Evaluation must examine whether the mechanisms of reproduction preserve contestability, participation, and the possibility of revision or whether they make domination and exclusion increasingly difficult to reverse.

The normative status of generativity is consequently conditional and relational. GRE can identify generative mechanisms and compare their consequences without assigning a universal value to generation itself. Normative evaluation begins when the analysis asks how generated consequences affect subjects, relations, capacities, values, dependencies, and future possibility. The remaining subsections specify those dimensions in greater detail.

3.13.2 Generated Value and Generated Harm

Generated value and generated harm are parallel analytical objects. Both can emerge downstream from an economic relation, both can propagate beyond the administrative recipient, and both can change form as they circulate. The evaluative task is therefore broader than measuring the immediate benefit and subtracting a directly observed cost. GRE asks how value and harm are produced, distributed, converted, accumulated, displaced, and transmitted across scales and time.

Generated value can include income, capability, knowledge, security, trust, coordination, infrastructure, recognition, institutional capacity, ecological restoration, or access to future opportunities. Some forms of value are directly appropriable by a subject; others exist only through a relation or shared condition. A public standard, a trusted institution, a functioning ecosystem, or a community of practice can generate benefits whose value cannot be represented adequately as the possession of one individual. GRE therefore evaluates value at the level at which it is generated and realized.

Generated harm has equally varied forms. An intervention can increase surveillance, dependency, stigma, ecological burden, exclusion, precarity, misinformation, or concentration of bargaining power even when the designated recipient receives a material benefit. Harm can also be displaced. A low consumer price can be sustained through labor conditions elsewhere in the supply chain. Local ecological improvement can depend on transferring waste or extraction to another region. An automated system can reduce transaction costs while increasing the exposure of a minority of users to unreviewable classification errors. Evaluation must therefore examine relational incidence rather than only administrative incidence.

Value and harm can coexist within the same generative pathway. Education can expand capability while imposing debt. Infrastructure can improve access while displacing residents. Intellectual-property protection can support some forms of investment while constraining downstream experimentation. Social protection can reduce insecurity while creating reporting burdens or intrusive eligibility regimes. Such configurations should not be forced into a premature net-value judgment when the affected values are heterogeneous and differently distributed.

Temporal ordering further complicates evaluation. Harm can be immediate while value is delayed, or the reverse. Some effects are reversible; others create durable path dependence. A temporary subsidy may generate a lasting market or a lasting dependency. A short-lived exclusion can alter educational or professional trajectories for decades. GRE therefore records persistence and reversibility as part of the evaluative description rather than treating all consequences as contemporaneous flows.

This framework also makes attribution important. A downstream harm may be associated with an intervention without being generated by the mechanism under study. Conversely, a benefit may be credited to an intervention even though it depends mainly on pre-existing relations or complementary institutions. Normative evaluation should therefore inherit the epistemic discipline of Section 3.11: claims about generated value and harm require a stated mechanism, boundary, scale, and degree of evidential confidence.

3.13.3 Participation

Participation concerns the capacity of affected subjects to enter, influence, contest, benefit from, and withdraw from the relations through which economic life is organized. It is an evaluative object because economic systems do more than distribute resources. They distribute positions from which subjects can speak, act, create, coordinate, challenge classifications, and contribute to future generation. A configuration can therefore increase material output while narrowing meaningful participation.

Participation has several dimensions. Access concerns whether a subject can enter a relevant institution, market, infrastructure, profession, community, or decision process. Voice concerns whether the subject can make claims that receive institutional attention. Influence concerns whether participation can alter decisions rather than merely register preference. Recognition concerns whether the subject is legible within the categories through which resources and rights are allocated. Contestability concerns whether classifications, decisions, or rules can be challenged. Exit concerns whether participation remains voluntary in a meaningful sense or is sustained by dependence and prohibitive switching costs.

These dimensions need not move together. A platform can provide wide access while retaining centralized control over ranking and rule change. A formal consultation process can permit voice while leaving participants with little influence. A labor market can allow nominal exit from an employer while economic insecurity makes exit practically costly. A public service can grant rights in principle while administrative categories render some users difficult to recognize. GRE therefore avoids reducing participation to formal inclusion.

Participation also has a generative dimension. Being able to participate can develop knowledge, confidence, social ties, institutional literacy, bargaining capacity, and new forms of collective organization. Exclusion can have the opposite effect by reducing opportunities to acquire the capacities later required for participation. Present access can therefore shape future access. Evaluation should examine whether an arrangement generates broader capacities for participation or produces cumulative disadvantages that narrow future entry.

The economic significance of participation becomes especially visible under conditions of technological abundance. If productive tasks can increasingly be performed by artificial or highly automated systems, a framework that ties economic participation exclusively to productive necessity can leave human subjects with reduced access to income, institutions, social recognition, or meaningful collective activity. GRE does not presume a particular technological outcome, but it treats the institutional organization of participation as a distinct problem from the allocation of productive tasks.

Participation should not be romanticized. More participation can impose time costs, reproduce inequalities in voice, or shift responsibility onto subjects with limited resources. Some technical decisions require specialized knowledge; some participants may prefer delegation. The normative question therefore concerns the quality and consequences of participation, including who bears its burdens, what forms of representation are available, and whether nonparticipation is compatible with protection from arbitrary decisions.

3.13.4 Capability

Capability concerns the effective ability of subjects to pursue relevant actions and ways of living within their actual relational and institutional conditions. For GRE, capability is an especially important evaluative object because economic relations can generate or destroy the conditions through which resources become usable. An allocation that appears equal at the level of resources can produce unequal capability when subjects face different conversion conditions.

Capability therefore extends evaluation beyond possession. Access to money, information, technology, or legal rights matters only partly through the quantity received. Its practical significance depends on health, time, knowledge, infrastructure, social recognition, legal status, language, care obligations, physical accessibility, institutional trust, and many other conversion conditions. GRE can analyze these conditions as part of the relational field through which a resource becomes an effective opportunity.

Capabilities can also be cumulative. Education can increase the ability to learn further skills. Secure housing can improve the ability to sustain employment or study. Access to digital infrastructure can expand the capacity to participate in markets, administration, and knowledge production. Conversely, repeated exclusion can reduce the capacities needed to take advantage of later opportunities. Evaluation should therefore trace capability trajectories rather than treating capability as a static stock.

The generative perspective adds a second question: who controls the conditions under which capability can be exercised? A subject may possess technical competence while depending on a platform, license, visa, credential, payment network, data infrastructure, or institutional recognition. Capability is then relationally enabled. If access to the enabling condition can be withdrawn unilaterally, the subject's practical freedom may be more fragile than a simple skill inventory suggests.

Capability evaluation must also preserve normative pluralism. GRE does not need to specify one universal list of valuable capabilities in order to treat capability formation as economically significant. Different inquiries can justify different evaluative sets depending on the affected population, institutional context, and normative framework. The important discipline is to state which capabilities are being evaluated, why they matter, and how their measurement relates to the actual opportunities of subjects.

The distinction between capability and performance is equally important. A subject can possess a genuine opportunity without exercising it. Economic evaluation should not automatically infer deprivation from nonuse or success from observed functioning. Choices can reflect preference, but they can also reflect adaptation to constraint, uncertainty, social expectation, or limited information. GRE therefore treats capability as an evaluative lens that requires contextual interpretation rather than direct inference from observed behavior alone.

3.13.5 Relational Quality

Relational quality concerns the properties of the relations through which economic activity is organized. It directs evaluation toward features that can disappear when

analysis looks only at individual outcomes. Two arrangements can deliver similar material distributions while differing substantially in reciprocity, transparency, recognition, reliability, contestability, vulnerability to arbitrary power, or the burdens required to sustain cooperation.

Relational quality is deliberately a plural category. A high-quality relation in one context can emphasize trust and continuity; another can require independence and easy exit; a third can require procedural transparency or protection from discrimination. GRE therefore does not assume that one relational form is universally superior. It asks which properties are normatively relevant to the local relation and how those properties affect both current experience and later generative possibility.

Trust provides one example. Trust can reduce transaction costs, support cooperation, and enable forms of joint action that formal contracting cannot fully specify. Yet trust can also create vulnerability when one party controls information or enforcement. Dense trust within a group can coexist with exclusion of outsiders. Evaluation therefore concerns the conditions under which trust is generated, whether reliance is reciprocated, and what protections exist when trust is breached.

Recognition provides another example. Economic relations can treat subjects as interchangeable units or as participants whose claims and histories matter. Recognition can affect bargaining, access, dignity, willingness to cooperate, and institutional legitimacy. At the same time, institutional recognition often depends on categories that simplify complex identities. A recognition regime can include some subjects by making others invisible. Relational quality therefore includes the revisability of the categories through which recognition is granted.

Contestability is especially important in relations involving asymmetry. A subject may accept unequal expertise, authority, or capability when decisions remain reviewable and reasons can be challenged. The same asymmetry can become more problematic when rules are opaque, appeals are impossible, or dependence makes disagreement costly. GRE therefore treats relational quality as connected to the governance of asymmetry rather than to equality in every dimension.

Relational quality also has generative consequences. Relations characterized by reliability and fair contestation can support investment, experimentation, and long-term cooperation. Relations characterized by arbitrary sanction or unstable recognition can encourage defensive behavior, information withholding, and short planning horizons. Evaluation should consequently examine both the intrinsic and generative significance of relational quality without assuming that its value can be reduced to later efficiency gains.

3.13.6 Future Possibility

Future possibility concerns the range and quality of trajectories that remain realistically available after an economic relation or intervention has taken effect. It is central to GRE because present arrangements continually reshape the conditions of later action. Evaluation therefore extends beyond current welfare to ask whether subjects and institutions retain meaningful capacity to revise, learn, exit, recombine resources, or pursue alternative forms of life and organization.

Future possibility differs from abstract logical possibility. An option can exist formally while remaining practically inaccessible because of cost, law, infrastructure, knowledge, social position, or path dependence. GRE is concerned with feasible and relationally supported possibility. The relevant question is whether subjects possess the conditions required to convert an apparent option into a credible trajectory.

Economic development can expand future possibility by generating infrastructure, education, savings, institutional competence, public knowledge, and trusted coordination. It can also narrow possibility through debt lock-in, ecological depletion, monopoly, rigid standards, irreversible investment, or loss of local capability. The same intervention can expand options for one group while constraining another. Evaluation must therefore be distributional and multiscale.

Optionality also interacts with commitment. Some valuable projects require long-term coordination, sunk investment, and stable expectations. Preserving every option can prevent the formation of institutions whose value depends on continuity. GRE therefore does not treat maximal reversibility as a universal goal. It asks whether commitments are justified, whether affected subjects understand the resulting constraints, whether revision remains possible under changing conditions, and whether the burdens of irreversibility are distributed fairly.

The temporal horizon of evaluation matters. A policy that preserves short-run choice can undermine long-run ecological or fiscal possibility. A restrictive rule can reduce present options while protecting conditions needed for future generations. GRE therefore requires explicit time horizons and rejects the assumption that present preference alone exhausts normative relevance. Intergenerational effects become part of economic evaluation when current activity alters the capability and action space available later.

Future possibility also provides a bridge between economic and political evaluation. Control over infrastructure, standards, data, property, legal categories, or knowledge systems can determine which later projects become feasible. Power can therefore operate by structuring possibility before any specific decision is made. Evaluation of future possibility helps identify such upstream effects and prepares the analysis of power in the following section.

3.13.7 Dependency and Domination

Dependency is a pervasive feature of economic life. Individuals depend on households, organizations, infrastructures, ecological systems, legal institutions, markets, and other persons. Firms depend on suppliers, finance, standards, workers, customers, and public order. Dependency therefore cannot serve as a simple indicator of injustice. The evaluative problem concerns the structure of dependence: how essential the relation is, whether alternatives exist, how burdens and benefits are distributed, and whether one party can exercise discretionary power over another's conditions of action.

Some dependencies are reciprocal and mutually enabling. Specialization creates interdependence because actors can achieve more through coordinated reliance than through autarky. Care relations can involve deep dependence while also generating security, capability, and belonging. Public infrastructure creates dependence

on collective institutions that may be normatively desirable. GRE therefore distinguishes dependency from domination rather than treating self-sufficiency as the default ideal.

Domination becomes relevant when dependency is combined with power that is difficult to contest, exit, or subject to accountable rules. A worker can depend on an employer, a seller on a platform, a tenant on a landlord, or a state on a creditor. Whether the relation becomes dominating depends on the available alternatives, procedural protections, transparency, collective organization, legal constraints, and the ability to challenge arbitrary decisions. The analysis therefore concerns relational structure rather than the mere presence of unequal capability.

Generative mechanisms can deepen dependency over time. A platform can become more indispensable as participants invest in platform-specific reputation or data. A lender can acquire increasing influence when refinancing becomes necessary. A technology ecosystem can create switching costs through proprietary standards and complementary investments. Such processes transform an initially optional relation into one that shapes the subject's future possibilities. GRE evaluates the trajectory of dependency, not only its initial contractual form.

Dependency can also be hidden by administrative boundaries. An organization may appear autonomous while relying on unpaid care, public infrastructure, ecological services, or precarious subcontracting. A wealthy region can reduce local dependence by externalizing extraction elsewhere. Evaluation should therefore trace dependency across scales and identify whose capacities sustain the apparent independence of others.

The normative task is consequently to distinguish enabling interdependence from dependency that concentrates arbitrary power or systematically transfers risk. This distinction is contextual and requires attention to alternatives, voice, exit, reciprocity, and governance. GRE can map these conditions economically while leaving broader ethical judgment open to explicit normative argument.

3.13.8 Generative Foreclosure

Generative foreclosure occurs when a present economic relation, intervention, or institutional arrangement reduces the capacity to generate relevant future alternatives. Foreclosure is stronger than an ordinary opportunity cost. Every choice excludes some alternatives because resources and time are finite. Generative foreclosure concerns changes to the conditions of future generation themselves: the loss of capabilities, relations, infrastructures, ecological conditions, institutional pluralism, or epistemic resources required to create or recognize later options.

A technological standard can produce generative foreclosure when complementary investment makes alternative architectures prohibitively costly. Concentrated ownership of research infrastructure can narrow which questions can be investigated. Educational exclusion can reduce not only present opportunity but also the later capacity to formulate and pursue new projects. Ecological degradation can remove future productive and cultural possibilities that current actors cannot fully specify. In each case, the loss concerns the generative field rather than one foregone transaction.

Foreclosure can be intentional or emergent. A dominant actor may deliberately raise barriers to entry. An institution may unintentionally create lock-in through cumulative coordination. A society may deplete a resource without any actor intending to eliminate later possibilities. Normative evaluation therefore cannot rely only on motive. It must examine the mechanisms through which possibility is narrowed and the distribution of the resulting loss.

The concept also requires restraint. Stable institutions necessarily reduce some degrees of freedom by creating rules, commitments, standards, and expectations. Such constraint can itself enable generation by lowering uncertainty and coordinating investment. GRE therefore distinguishes productive structuring from foreclosure by asking whether the constraint preserves meaningful routes for learning, contestation, recombination, and revision relative to the values at stake.

Irreversibility is an important but incomplete indicator. Some irreversible changes are desirable; some reversible systems can still reproduce severe domination. The evaluative question concerns which future capabilities and relations are lost, who bears the loss, whether the loss was foreseeable, whether affected subjects had meaningful participation, and whether compensating generative capacities are created elsewhere. Foreclosure is thus a relational and normative concept rather than a synonym for permanence.

Generative foreclosure gives GRE a way to evaluate economic processes whose most important harms are difficult to observe in present output measures. The absence of a future innovation, institution, community, ecological state, or life trajectory cannot be measured in the same way as an existing commodity. Evaluation therefore requires counterfactual and historical reasoning, explicit uncertainty, and humility concerning possibilities that current categories may fail to represent.

3.13.9 Plural and Incommensurable Values

GRE assumes that economic evaluation can involve several forms of value whose relations are partial, contested, or context-dependent. Income, security, autonomy, care, recognition, ecological integrity, knowledge, cultural continuity, trust, and future possibility can matter simultaneously without reducing naturally to one metric. The presence of plural value therefore creates a problem of judgment rather than a technical defect awaiting universal conversion.

Commensuration can still be useful. Budgets require numerical comparison; cost-effectiveness analysis can clarify trade-offs within a defined objective; markets generate prices that coordinate many transactions; legal and administrative systems require thresholds and categories. GRE treats these operations as institutionally situated forms of comparison. The existence of a price or index demonstrates that a conversion rule has been established for a purpose. It does not prove that every ethically relevant dimension has been captured.

Partial comparability is often sufficient for action. One option can dominate another across several relevant dimensions without requiring a common cardinal scale. Thresholds can exclude arrangements that violate minimum conditions of safety, participation, or rights. Deliberative procedures can address remaining conflicts. Scenario analysis can reveal how rankings change under different value weightings.

GRE therefore does not infer decision paralysis from incommensurability.

Plural value also changes the interpretation of conversion. An institution can transform cultural recognition into market demand, social trust into credit access, educational status into employment opportunity, or ecological resources into monetary revenue. Such conversions can create value while also degrading or crowding out the source relation. Evaluation should therefore examine who controls conversion interfaces, which values become legible after conversion, and which remainders disappear from institutional accounting.

Conflicts among values can also be distributional. A policy may maximize aggregate income while concentrating ecological harm in one community. A conservation programme may protect biodiversity while limiting livelihoods or customary access. An automated service may improve average efficiency while weakening procedural recognition for individuals who require exceptions. These conflicts cannot be resolved by naming all values equally important. Normative judgment must specify priority rules, procedural safeguards, compensation, thresholds, or other principles appropriate to the case.

GRE's contribution is to keep the value architecture visible. It can trace where values are generated, converted, captured, dissipated, or rendered institutionally invisible. It can identify the relations through which one value form gains priority over another. It can also expose where apparent commensurability depends on a contested institutional convention. The choice among competing normative resolutions remains an explicit ethical and political task.

3.13.10 Relation between GRE and GREthic

The normative dimensions developed in this section create a direct interface between GRE and GREthic. Their division of labor should remain explicit. GRE is an economic research programme concerned with relational constitution, generation, allocation, value transformation, capability, power, dependency, and changes in future possibility. GREthic addresses the broader ethical problem of how relational and generative consequences should be interpreted, justified, contested, and governed when several values, subjects, and temporal horizons are involved.

This division does not make GRE normatively empty. Economic research already contains evaluative choices in the definition of welfare, harm, efficiency, opportunity, risk, and admissible intervention. GRE adds explicit dimensions such as participation, relational quality, future possibility, dependency, domination, and foreclosure. These dimensions belong legitimately within economic evaluation because they describe economically generated conditions. The ethical question becomes more demanding when the inquiry asks how competing dimensions should be weighted, which constraints should function as side conditions, whose claims have priority, or what constitutes a just relation.

GREthic can therefore operate as a neighboring normative domain rather than as a final module appended after economic analysis. Ethical judgment can alter the research boundary, the choice of evaluative dimensions, the treatment of uncertainty, the design of participation, and the interpretation of evidence. Conversely, economic analysis can revise ethical judgment by revealing hidden dependencies,

indirect harms, conversion mechanisms, or long-run consequences that were absent from the initial normative description. The relation between GRE and GREthic is consequently iterative.

A generative ethical perspective also faces the problem of changing criteria. Institutions learn, social meanings evolve, new subjects become visible, and technologies create forms of action that earlier normative vocabularies did not anticipate. Ethical evaluation therefore cannot assume that a fixed list of criteria will remain sufficient under every historical condition. GREthic must be capable of examining how normative categories themselves emerge, stabilize, exclude, and require revision. This does not imply that every value is historically arbitrary. It means that the institutional expression and interpretation of values require continuing critical examination.

The interface is especially important for application-dominant praxis. An intervention can be technically effective and economically generative while raising unresolved questions of justice. In such cases GRE can provide the relational diagnosis, trace the effects, identify capability changes, map dependency, and evaluate future possibility. GREthic can help articulate the normative standards governing participation, acceptable asymmetry, protection from domination, treatment of irreversible harm, and procedures for revising the intervention when values conflict.

The distinction also protects disciplinary restraint. GRE need not become a complete moral philosophy in order to analyze normatively significant economic processes. GREthic need not replace economic explanation with ethical vocabulary. Their productive relation depends on maintaining both the empirical and normative burdens of argument. Ethical claims require justification; economic claims require evidence and mechanism; interventions require both.

The normative architecture established in Section 3.13 therefore completes an important part of Chapter 3's constitution of GRE. Generativity becomes an object of evaluation rather than a criterion of goodness. Generated value and harm, participation, capability, relational quality, future possibility, dependency, domination, foreclosure, and plural values provide a multidimensional field for judgment. The following section turns to one of the most consequential mechanisms through which these dimensions become unequally distributed: power and asymmetry within the GRE problem-space.

3.14 Power and Asymmetry within the GRE Problem-Space

Generative Relational Economics requires an explicit account of power because economic relations rarely begin from symmetric positions, and the consequences of those asymmetries can accumulate through the very processes that GRE studies. The role of this section is to identify the principal forms of asymmetry that can become economically consequential and to clarify the conditions under which asymmetry is converted into power. Its objective is to avoid two opposite reductions: treating every difference between subjects as domination, and treating power as a property possessed independently of the relations through which it becomes effective. The discussion proceeds through resource, capability, knowledge, institutional, vulnerability, and exit asymmetries; the conversion of asymmetry into power; the limits

of capability equalization and counter-power; and relational governance under persistent asymmetry. The method is constitutive and analytical. It establishes a vocabulary for later empirical, normative, and governance work without presuming that one scalar measure can represent every relevant form of power.

The starting point is a distinction between *asymmetry* and *power*. An asymmetry exists when subjects occupy different positions with respect to resources, capacities, information, institutional authority, vulnerability, or alternatives. Power arises when such differences become usable, durable, or institutionally supported means of shaping another subject's feasible actions, access to resources, interpretive environment, exposure to risk, or future conditions of generation. A highly capable subject can therefore remain weak in a particular relation when its capabilities are irrelevant to the terms of interaction. Conversely, a subject with modest resources can exercise substantial power when it controls a scarce interface, legal authorization, standard, platform, bottleneck, or exit option on which others depend.

Power is consequently relational, domain-specific, and temporally structured. The same pair of subjects can be asymmetric in opposite directions across different domains. A worker can possess knowledge essential to production while remaining institutionally subordinate in wage negotiation. A state can regulate a corporation domestically while depending on that corporation for infrastructure, tax revenue, or technological expertise. A user can choose among digital services while having little capacity to alter the standards through which data are collected and converted into commercial value. The relevant question for GRE is therefore not simply who has more, but how a difference is connected to a mechanism through which one subject can affect another subject's present options or future generative conditions.

This emphasis also distinguishes power from immediate coercion. Power can operate through direct commands, but it can also operate by shaping defaults, eligibility criteria, technical standards, access routes, classifications, expectations, and the cost of refusal. It can be episodic or structurally persistent. It can be consciously exercised or reproduced through institutions whose participants do not individually intend the resulting asymmetry. GRE therefore treats power as a family of relational mechanisms that affect the generation and distribution of possibility. Normative evaluation enters when those mechanisms are assessed in terms of domination, justice, harm, participation, capability, or foreclosure, but descriptive power analysis must first identify how the relation works.

3.14.1 Resource Asymmetry

Resource asymmetry concerns unequal access to economically consequential stocks or flows such as money, land, infrastructure, energy, data, equipment, labor time, organizational slack, credit, logistics, or legally protected assets. It is among the most visible forms of economic difference because many resources are already measured through accounting, ownership, or administrative systems. Yet possession alone does not determine relational power. What matters is the role that a resource plays within a specific relational configuration.

A resource becomes power-relevant when control over it changes another subject's feasible set or bargaining position. The owner of a scarce input can influence down-

stream producers when substitutes are limited and switching is costly. A lender can impose conditions when borrowers face liquidity constraints and alternative finance is unavailable. A landlord's control over housing can become consequential when residence is tied to employment, schooling, legal status, or local social networks. A platform's control over computational infrastructure can matter when users, firms, or public institutions depend on that infrastructure for participation in other economic processes. The same nominal resource can therefore carry very different power consequences depending on substitutability, timing, dependence, and institutional context.

Resource asymmetry also has a generative dimension. Resources can be consumed, but they can also be converted into capacities for producing later resources. Capital can finance research, data collection, legal representation, lobbying, recruitment, or acquisition. Infrastructure can make future coordination cheaper. Land ownership can generate collateral. A large user base can generate additional data and network effects. Resource inequality can therefore reproduce or amplify itself when existing holdings enable access to mechanisms that generate further advantage.

GRE analysis should distinguish this recursive possibility from simple accumulation. A subject can possess more resources without gaining additional structural leverage if the relevant relation remains competitive and alternatives remain accessible. Conversely, a relatively small resource difference can become decisive when it controls a bottleneck or threshold. The analytical task is thus to identify the conversion mechanism: which resource matters, to which relation, over what time horizon, through which institutional or technical structure, and with what downstream effects on future capacity.

This distinction also matters for policy. Redistribution of money can reduce one resource asymmetry while leaving infrastructural, legal, informational, or organizational asymmetries intact. Access subsidies can improve current consumption without altering control over the mechanisms that generate future options. Resource equalization is therefore one possible intervention among several. GRE asks whether the relevant inequality lies in holdings, access, conversion capacity, rule-making position, or the structure through which resources become generative.

3.14.2 Capability Asymmetry

Capability asymmetry concerns differences in what subjects are able to do within a defined economic relation. Capabilities may include technical competence, organizational coordination, computational capacity, mobility, learning, bargaining skill, physical endurance, social connectivity, legal competence, linguistic access, or the ability to mobilize resources under time pressure. Capability differs from resource possession because two subjects with formally similar resources can have very different capacities to convert them into effective action.

This distinction is central in contemporary economies where productive capability can differ sharply across persons, organizations, and artificial systems. A large model can process information at scales unavailable to an individual worker. A multinational firm can coordinate legal, financial, and logistical operations across jurisdictions that a small supplier cannot match. An experienced organization can exploit

a regulatory opportunity that a newly formed association does not yet understand. These differences can affect bargaining positions, speed, error tolerance, and the range of feasible strategies.

Capability asymmetry becomes power-relevant when it changes the terms under which other subjects must participate. Superior prediction can support price discrimination. Superior legal capacity can make contractual complexity costly for weaker parties to contest. Superior computational capacity can enable rapid experimentation over markets, attention, or product design. Superior logistical coordination can make a supplier difficult to replace. In each case the capability matters because it is connected to a relation through which the more capable subject can shape conditions faced by others.

At the same time, capability differences do not by themselves establish domination, moral superiority, or ontological hierarchy. Specialized capabilities are common in cooperative systems. A surgeon and patient, pilot and passenger, engineer and user, or teacher and student occupy asymmetric capability relations that can be socially valuable when authority, accountability, consent, and institutional safeguards are appropriately organized. The relevant GRE question is whether capability asymmetry becomes a mechanism for unilateral control, extraction, dependency, or foreclosure, or whether it is embedded in reciprocal and revisable arrangements that distribute benefits and protect affected subjects.

Capability asymmetry also changes historically. Training, tools, institutional access, automation, collective organization, and technical infrastructure can expand or reduce particular capabilities. The introduction of artificial intelligence makes this especially visible because capability gaps can change quickly and unevenly across tasks. A useful GRE analysis therefore tracks the trajectory of capability differences rather than treating them as fixed attributes. It asks who gains new capabilities, who loses the economic relevance of existing ones, what new dependencies arise, and which institutions govern the conversion of capability differences into economic authority.

3.14.3 Knowledge Asymmetry

Knowledge asymmetry concerns unequal access to information, interpretive resources, expertise, explanatory models, evidence, or the capacity to recognize the significance of available information. It extends beyond the familiar problem of one party knowing more facts than another. Economic power can also arise from asymmetries in classification, prediction, interpretation, and the ability to determine which descriptions become institutionally actionable.

A seller may know more about product quality than a buyer. A financial institution may know more about pricing models and contractual risk than a client. A platform may observe aggregate behavioral patterns invisible to individual users. A government agency may hold administrative records unavailable to the public. A technical community may control specialized vocabularies required to contest a decision. These are distinct knowledge relations, and their power effects depend on how the knowledge is connected to action.

Knowledge becomes especially consequential when one subject can make decisions on the basis of information that another cannot inspect, verify, or meaningfully

interpret. The weaker subject may then depend on assurances, reputation, certification, professional norms, or institutional oversight. Such dependence is not intrinsically pathological; complex economies require extensive reliance on expertise. The power problem emerges when epistemic dependence combines with weak accountability, conflicts of interest, high switching costs, or control over the channels through which claims can be challenged.

Knowledge asymmetry also includes the power to produce or stabilize representations. Economic subjects are frequently acted upon through categories: credit scores, risk classes, performance metrics, eligibility rules, rankings, profiles, diagnoses, forecasts, and algorithmic classifications. The subject who controls the production or interpretation of a category can influence access to employment, credit, insurance, visibility, public benefits, or market participation. In such cases knowledge power does not consist only in possessing hidden information. It also consists in shaping the representational architecture through which institutions perceive other subjects.

GRE therefore distinguishes informational access, interpretive competence, model authority, and representational control. These dimensions can diverge. Data can be publicly available while computational requirements make meaningful analysis inaccessible. A model can be technically transparent while the institutional consequences of its output remain opaque. A subject can understand a classification yet lack any procedure for contesting it. Knowledge governance consequently requires more than disclosure. It may require intelligibility, auditability, contestability, alternative expertise, evidential access, and institutional routes through which interpretations can be revised.

The generative dimension of knowledge asymmetry is equally important. Knowledge can generate later knowledge, and control over data or research infrastructure can compound advantages. Organizations with larger observational fields can train better models, attract more users, and generate still more data. Institutions that define legitimate evidence can also shape which questions receive funding and which phenomena become visible. Knowledge asymmetry can therefore alter the future epistemic field itself, making it a central GRE object rather than merely a background imperfection in exchange.

3.14.4 Institutional Asymmetry

Institutional asymmetry concerns unequal positions within rule-making, authorization, recognition, enforcement, classification, and dispute-resolution structures. It is distinct from resource or capability asymmetry because an institution can grant authority to a subject whose private resources are limited. A regulator, court, standards body, professional association, university, central bank, certification agency, or platform governance unit can exercise substantial influence through the rules it is authorized to establish or interpret.

Institutional position shapes who can define admissible participation, whose claims count, which categories receive legal recognition, and which remedies are available when conflict occurs. Formal authority is one obvious form. Less visible forms include agenda-setting, control over procedure, discretionary interpretation, default-setting, accreditation, and the capacity to delay or accelerate decisions.

Timing itself can become power when one party can tolerate delay and another cannot.

Institutional asymmetry is often self-reinforcing because rules influence the resources and capabilities available to participants. Licensing can protect quality and safety while also raising entry barriers. Intellectual-property rules can reward innovation while concentrating control over subsequent use. Procurement standards can improve accountability while favoring organizations with administrative capacity to comply. Corporate governance rules can distribute formal voting rights while leaving agenda formation concentrated. Institutional analysis therefore asks not only what a rule states but how it reorganizes relational possibilities.

GRE treats institutional asymmetry as especially important because institutions mediate conversion among other forms of asymmetry. Wealth can be translated into lobbying, litigation, or organizational access. Expertise can be converted into recognized professional authority. Formal office can provide privileged information. Institutional status can determine whose vulnerability receives protection and whose losses remain externalized. Institutions are thus conversion structures through which resources, capabilities, knowledge, and recognition become power.

This does not imply that institutional asymmetry should be eliminated. Governance itself requires differentiated roles, mandates, and responsibilities. The relevant question is how authority is bounded, justified, monitored, revisable, and connected to affected subjects. An institution can exercise asymmetric authority while remaining constrained by procedure, transparency, appeal, rotation, representation, or substantive rights. GRE therefore analyzes the architecture of authority rather than treating formal symmetry as the only legitimate institutional form.

3.14.5 Vulnerability Asymmetry

Vulnerability asymmetry concerns differences in exposure to loss and differences in the capacity to absorb, recover from, or adapt to that loss. It introduces a dimension of power that is easy to miss when analysis focuses only on holdings or productive capacities. Two subjects may enter the same formal transaction while facing radically different consequences if the transaction fails.

A worker dependent on one employer can face greater loss from contract termination than the employer faces from replacing one worker. A small supplier can be more vulnerable to delayed payment than a large purchaser is to delayed delivery. A tenant can face relocation costs that exceed the landlord's costs of replacing the tenant. A household with minimal savings can be more affected by a small price shock than a wealthier household is by a larger nominal loss. These differences change bargaining relations even when contractual rights appear formally symmetric.

Vulnerability can arise from biological, social, legal, ecological, financial, or infrastructural conditions. It can also be generated by prior economic relations. Debt can increase sensitivity to income interruption. Loss of public infrastructure can increase dependence on private providers. Concentrated employment can make a region vulnerable to one firm's decisions. Data-driven personalization can expose particular groups to targeted exploitation. Vulnerability is therefore often historically produced rather than merely given.

The conversion of vulnerability into power occurs when another subject can credibly condition access to necessities, impose risks, or shift costs onto those less able to bear them. The stronger party need not intentionally threaten harm. Structural vulnerability can influence behavior because subjects anticipate the consequences of refusal. A worker may accept unfavorable terms because unemployment is costly. A state may offer concessions to a mobile investor because local employment is concentrated. A consumer may accept invasive data practices because essential services have become digitally mediated.

GRE analysis should also distinguish vulnerability from weakness in every domain. A subject can be technologically capable and financially wealthy while highly vulnerable to reputational, legal, ecological, or infrastructural disruption. Conversely, a subject with few resources can be relatively resilient when needs are modest, alternatives are available, and social support is strong. Vulnerability therefore requires explicit specification of the relevant hazard, exposure, recovery capacity, and time horizon.

This perspective has normative implications, but the descriptive analysis comes first. Governance can reduce vulnerability by creating buffers, insurance, redundancy, public options, collective support, or guaranteed access to essentials. Yet such interventions can create new dependencies if they centralize provision without contestability. The GRE question is how vulnerability is generated, distributed, converted into leverage, and transformed by the institutions intended to manage it.

3.14.6 Exit Asymmetry

Exit asymmetry concerns differences in the cost, feasibility, and consequences of leaving a relation. It is one of the clearest mechanisms through which other asymmetries become durable. A relation can appear voluntary at entry while becoming difficult to leave once investments, identities, data, legal obligations, infrastructures, social ties, or specialized capabilities accumulate around it.

Exit costs take many forms. Financial penalties and contractual restrictions are explicit examples. Others include retraining, relocation, loss of reputation, incompatibility of technical systems, loss of accumulated data, social isolation, disruption of care arrangements, immigration consequences, or forfeiture of institution-specific benefits. Exit can also be asymmetric because one party can replace the other more easily. A large platform can lose an individual user with little consequence, while the user may lose access to a network on which professional or social activity depends.

Exit asymmetry matters because it alters the practical meaning of consent. Continued participation can reflect genuine preference, but it can also reflect high switching costs, dependence, fear of retaliation, or lack of viable alternatives. GRE therefore treats observed continuation as evidence that requires interpretation rather than as automatic proof that a relation remains mutually beneficial.

The generative dimension of exit is particularly important. Participation in a relation can produce assets that are specific to that relation: reputation scores, social connections, customized tools, accumulated knowledge, eligibility, or identity. These assets can increase productivity and value while simultaneously making exit more costly. Successful cooperation can therefore deepen dependence even without inten-

tional lock-in. The governance problem is to preserve the benefits of relational investment while preventing accumulated specificity from becoming unilateral leverage.

Exit is also only one response to problematic relations. Voice, contestation, collective bargaining, institutional appeal, and internal reform can be preferable when relationships are valuable and exit would destroy jointly generated capacities. An exclusive focus on exit can therefore privilege subjects already able to move while leaving the most embedded or vulnerable participants unprotected. GRE analyzes exit together with voice, representation, repair, and alternative provision.

Exit asymmetry can be reduced through interoperability, portability, nonretaliation rules, social insurance, public alternatives, transferable credentials, data mobility, and limits on restrictive contracts. Such measures alter the relational field even if few subjects actually leave. The credible possibility of exit can change bargaining power. Exit governance is therefore about the structure of alternatives, not merely the observed frequency of departure.

3.14.7 Conversion of Asymmetry into Power

The preceding forms of asymmetry become analytically significant when they are connected to mechanisms of conversion. GRE treats conversion as the process through which a difference in resources, capability, knowledge, institutional position, vulnerability, or exit becomes effective influence over another subject's options or over the conditions from which future options are generated. This conversion is neither automatic nor uniform.

Several relational conditions commonly affect conversion. Scarcity matters because control over abundant and substitutable resources usually provides less leverage than control over bottlenecks. Dependence matters because the value of an asymmetry rises when other subjects rely on the advantaged subject for essential functions. Replaceability matters because subjects with many alternatives can resist conditions that dependent subjects must accept. Coordination matters because individually weak subjects can aggregate resources or voice. Institutional recognition matters because formal rules can authorize, limit, or redirect the use of an advantage. Information matters because leverage can depend on subjects understanding their alternatives and the likely consequences of refusal. Time matters because a party that can wait often has bargaining advantages over a party facing urgent costs.

Power conversion can also be recursive. A resource advantage can buy expertise; expertise can influence institutional design; institutional design can protect future resource accumulation. Superior knowledge can improve targeting; improved targeting can increase profit; profit can finance further data collection. Control over infrastructure can generate dependence; dependence can support contractual authority; contractual authority can increase exit costs. Such cycles matter to GRE because they transform temporary differences into persistent relational structures.

The concept of conversion also helps distinguish power from inequality. A wealthy subject can lack power over a regulator empowered to impose binding rules. A technically capable firm can remain dependent on a monopolistic supplier. A state with formal sovereignty can be constrained by financial, technological, or security dependencies. Power maps therefore need not reproduce wealth rankings. GRE analysis

should trace conversion pathways rather than infer power from one observable variable.

Power can furthermore operate through the generation of expectations. If subjects anticipate that one party can impose costs, deny access, classify them adversely, or shape future opportunities, they may alter behavior before any explicit exercise occurs. This anticipatory effect can make power difficult to observe through events alone. Stable compliance can coexist with strong asymmetry precisely because overt conflict becomes unnecessary. Empirical inquiry may therefore need to study suppressed alternatives, unrealized options, counterfactual bargaining positions, and institutionalized expectations.

The conversion perspective also clarifies why power is domain-specific. A subject can be powerful in hiring and weak in finance, powerful in data and weak in law, powerful domestically and dependent internationally. GRE should therefore resist the temptation to compress heterogeneous power relations into one universal rank. A multidimensional mapping of asymmetries, conversion mechanisms, and affected generative conditions is often more informative than a single power score.

3.14.8 Limits of Capability Equalization

Capability enhancement is one important response to asymmetry. Education, public infrastructure, assistive technology, access to finance, legal aid, data access, computational tools, collective organization, and social protection can increase the ability of weaker subjects to participate, contest, adapt, and generate alternatives. Yet capability equalization has limits as a general theory of power reduction.

First, some asymmetries arise from differentiated roles rather than remediable deficits. Regulators and regulated entities, doctors and patients, judges and litigants, infrastructure operators and users, or specialized technical teams and general publics occupy different positions because complex systems distribute functions. Governance must then organize accountability across unequal roles rather than assume that every participant should acquire identical capabilities.

Second, capability enhancement can leave institutional conversion mechanisms untouched. Training workers may improve mobility while employers retain unilateral control over scheduling, surveillance, or termination. Financial literacy can improve decisions while contractual complexity and market concentration remain. Digital skills can expand participation while platforms retain control over standards, visibility, and data. Strengthening the weaker subject can therefore be valuable without fully altering the relation that generates the asymmetry.

Third, capabilities can themselves become positional. If all participants acquire a skill that was previously scarce, the advantage associated with that skill can move elsewhere. Credential inflation provides one familiar pattern: expanding qualifications can increase absolute competence while preserving relative competition for scarce positions. In technological domains, widespread adoption of one tool can raise the baseline expected from all participants and create a new asymmetry around access to more advanced infrastructure.

Fourth, equalization can impose burdens. Requiring vulnerable subjects to be-

come expert negotiators, data analysts, legal specialists, or cybersecurity practitioners shifts responsibility onto those already facing structural disadvantage. Some protections are better provided through institutional design, fiduciary duties, public options, default rules, or limits on permissible extraction than through endless demands for individual capability upgrading.

GRE therefore treats capability equalization as one component of relational governance. The relevant question is which asymmetry should be reduced by expanding capability, which should be bounded through institutional rules, which should be made contestable through collective organization, and which should be accepted as functionally necessary but governed through accountability. The objective is not symmetry for its own sake. It is to prevent capability differences from becoming unjustified control over the conditions of participation and future generation.

3.14.9 Limits of Counter-Power

Counter-power refers to capacities that enable subjects to resist, negotiate, constrain, or redirect an existing concentration of power. Collective bargaining, competition, regulatory oversight, courts, professional associations, consumer organization, public alternatives, investigative journalism, open technical standards, mutual aid, and democratic participation can all function as forms of counter-power in different contexts. GRE treats them as relational interventions rather than as automatic restorations of balance.

Counter-power is often necessary because persistent asymmetry cannot be addressed by individual adaptation alone. Workers can negotiate more effectively through collective organization. Small firms can benefit from shared infrastructure or interoperability mandates. Consumers can rely on regulators or courts when individual monitoring is costly. Communities can build institutions that reduce dependence on a single provider. Such arrangements change the structure through which asymmetry is converted into power.

Yet counter-power has limits. It can become concentrated in its own right. A union, regulator, professional body, platform cooperative, or civic organization can develop internal hierarchies and exclusion mechanisms. Institutions created to represent weaker subjects can become difficult for those subjects to contest. Competition can constrain one monopoly while producing instability or shifting concentration to another layer of the system. Transparency can expose misconduct while advantaging actors with superior capacity to process disclosed information. Counter-power therefore requires its own governance.

Counter-power can also reproduce the ontology of the power it contests. If resistance must use the same metrics, platforms, legal categories, or technical infrastructure established by the dominant actor, alternatives may remain confined within the existing field. A community can gain representation without gaining control over the categories through which its interests are recognized. A new market entrant can challenge price while leaving data extraction practices unchanged. GRE therefore asks whether counter-power changes bargaining within a relation or transforms the generative conditions of the relation itself.

Temporal asymmetry further complicates counter-power. Concentrated actors can

sometimes act quickly while collective organizations require deliberation, consent, and coordination. Conversely, public institutions can impose durable constraints that private actors cannot easily evade. The relevant balance is therefore dynamic. Effective governance must consider response speed, persistence, institutional learning, and the capacity of power holders to adapt around controls.

The limit of counter-power does not imply resignation. It indicates that balancing strategies should be evaluated recursively. A mechanism introduced to constrain power should itself be analyzed for new dependencies, exclusions, and conversion pathways. GRE's contribution is to keep that second-order question visible: what does the counter-power generate, whose capacities does it strengthen, which relations does it stabilize, and what new asymmetries emerge from its operation?

3.14.10 Relational Governance under Persistent Asymmetry

Many economic systems will continue to contain substantial asymmetries even under ambitious reforms. Subjects differ in knowledge, scale, specialization, mobility, resources, biological needs, legal mandates, technical capabilities, and exposure to risk. Relational governance therefore cannot depend on the expectation that legitimate order will emerge only after differences have been eliminated. Its task is to organize persistent asymmetry so that necessary differentiation does not become uncontrolled domination or generative foreclosure.

A GRE governance perspective begins by specifying the relevant asymmetries and their conversion mechanisms. It asks which subjects depend on which others, what alternatives exist, which resources or capabilities function as bottlenecks, who defines the institutional categories of participation, how vulnerability is distributed, and what happens if a subject attempts to exit or contest the relation. This diagnosis identifies where safeguards are likely to matter.

Several governance principles follow from the analysis, although their concrete form remains context-dependent. Authority can be bounded by mandate and review. Essential services can be protected by continuity obligations or public alternatives. Exit can be made more credible through portability and interoperability. Knowledge asymmetry can be addressed through independent expertise, audit, contestation, and evidential access. Vulnerability can be reduced through buffers, insurance, redundancy, and guaranteed minimum capacities. Collective organization can strengthen voice. Rule-making can include affected subjects without presuming that participation alone resolves all asymmetry. Institutions can preserve appeal, revision, and sunset mechanisms so that temporary arrangements do not harden into unchallengeable structures.

Relational governance also requires attention to generative conditions. A policy can constrain abusive behavior in the present while leaving the mechanisms that reproduce future dependence untouched. Conversely, an intervention can redistribute immediate resources while weakening the organizational capacities through which a community previously governed itself. GRE therefore evaluates governance at more than one temporal layer: present protection, future capability, relational quality, structural transformation, and preservation of alternative pathways.

The concept of persistent asymmetry also changes the meaning of fairness. For-

mal equality of rules can coexist with radically unequal vulnerability or exit costs. Identical disclosure can be useless when interpretive capacities differ. Equal access to a market can mask unequal control over infrastructure. Governance may therefore require differentiated protections or obligations in order to make participation substantively contestable. Such differentiation must itself remain transparent and revisable because protective categories can reify the subjects they are intended to assist.

Power analysis should also remain separate from final normative judgment. A concentrated authority may sometimes be justified by coordination, safety, fiduciary responsibility, or public purpose. A decentralized arrangement can reproduce severe power through infrastructure, convention, or cumulative advantage. GRE therefore does not infer justice from decentralization, symmetry, or participation alone. It supplies a relational map of how influence is generated and sustained; normative evaluation then asks whether those mechanisms are justified under the relevant ethical, legal, and political standards.

This section therefore places power within the GRE problem-space as a dynamic relation among asymmetries, conversion mechanisms, dependencies, institutional structures, and future generative conditions. Resource, capability, knowledge, institutional position, vulnerability, and exit are analytically distinct sources of asymmetry. Their conversion into power depends on scarcity, substitutability, dependence, coordination, authorization, time, and the structure of alternatives. Capability equalization and counter-power can alter these relations, but each has limits and can generate new asymmetries. Relational governance must consequently remain adaptive, contestable, and attentive to second-order effects.

The analysis also prepares the next constitutive problem. Persistent asymmetry does not occur among identical subjects. Economic relations increasingly connect persons, organizations, states, artificial systems, ecological systems, and other heterogeneous participants whose capacities, temporalities, vulnerabilities, and value structures differ in kind as well as degree. The following section therefore turns from asymmetry within relations to the broader problem of heterogeneity and coexistence.

3.15 Heterogeneity and Coexistence

Generative Relational Economics requires an explicit account of heterogeneity because many economic relations connect subjects, systems, and processes that differ in ways that cannot be reduced to variation along a single scale. The role of this section is to establish coexistence across heterogeneous forms as a constitutive problem of GRE rather than as a residual complication added after a homogeneous model has been constructed. Its objective is to clarify how economic coordination, exchange, dependence, conflict, and joint generation remain possible when participants differ in subject form, intelligence, temporality, vulnerability, value structure, and degree of mutual intelligibility. The discussion proceeds from heterogeneous subjects and forms of intelligence through temporal and vulnerability differences, heterogeneous values, partial mutual intelligibility, economic relation under incomplete commen-

surability, human–AI relations, more-than-human relations, and boundary cases involving radically different subjects. The method is constitutive and analytical. It identifies conditions under which heterogeneous coexistence can be studied without presuming either complete commonality or complete incomparability.

Heterogeneity matters to GRE for a reason deeper than descriptive diversity. Difference can alter the mechanisms through which relations are formed, interpreted, stabilized, and transformed. Subjects that process information at different speeds can experience the same contract differently. Subjects with different vulnerabilities can bear the same nominal risk unequally. Subjects organized around different value structures can participate in the same economic arrangement while understanding its significance in different terms. Human and artificial systems can cooperate productively while differing sharply in embodiment, temporal horizon, memory, responsibility, and normative status. Economic coexistence therefore often depends on interfaces that enable coordination across difference rather than on the elimination of difference itself.

This perspective also changes the analytical meaning of coordination. Coordination need not imply shared ontology, identical preferences, common measures of value, or full mutual comprehension. It can arise through partial translation, rule-governed interfaces, protocols, conventions, negotiated thresholds, legal forms, institutional guarantees, or stable expectations concerning a limited domain of interaction. Such arrangements can be robust even when deeper interpretations remain divergent. They can also be fragile when the interface suppresses differences that later become economically consequential. GRE therefore asks both how heterogeneous subjects manage to relate and which differences remain unresolved beneath an apparently successful relation.

Heterogeneity should consequently be distinguished from disorder. A heterogeneous system can possess highly organized relations, and a homogeneous representation can conceal important differences. Likewise, coexistence should be distinguished from harmony. Subjects can coexist through cooperation, competition, dependency, conflict, indifference, mutual constraint, or asymmetric accommodation. The relevant GRE question is not whether heterogeneity produces agreement, but how different forms remain connected, how the relation distributes benefits and burdens, and how the terms of coexistence shape future generative possibilities.

3.15.1 Heterogeneous Subjects

The first dimension of heterogeneity concerns the kinds of subjects that participate in economic relations. Earlier sections treated economic subjecthood as relationally situated, institutionally recognized, temporally persistent, and historically transformable. The present section extends that argument by emphasizing that an economy can contain multiple subject forms at once. Individual persons, households, firms, states, cooperatives, communities, platforms, algorithmic systems, hybrid organizations, and other collective or artificial arrangements can all occupy economically consequential positions while remaining different in constitution and status.

These differences matter because the capacities through which subjects enter relations are not interchangeable. A natural person may possess legal rights, embodied

needs, lived vulnerability, memory, social identity, and moral standing that differ categorically from the capacities of a corporation or software system. A corporation can persist across changes in personnel, accumulate assets, sign contracts, and coordinate action across large spatial scales. A public institution can exercise legally authorized powers that private actors lack. An artificial system can process or generate representations at speeds and volumes unavailable to human participants while lacking many forms of embodied participation through which human economic life is organized.

GRE therefore resists the temptation to create one abstract subject model and treat every participant as a parameterized instance of it. A unified formal representation can be useful for a local task, but the analyst must identify which dimensions of subjecthood have been suppressed. Treating a household, a company, and an automated trading system as "agents" can clarify interaction structure while obscuring differences in accountability, embodiment, temporal persistence, legal rights, or the capacity to experience harm. The representational convenience of a common agent label does not establish ontological or normative equivalence.

Heterogeneous subjecthood also means that relations can be constitutive in different ways for different participants. Employment may constitute livelihood and social identity for a worker while functioning as a cost and organizational input for a firm. Credit can appear as a portfolio exposure to a lender and as a condition of continued residence or enterprise survival to a borrower. A platform can treat a user interaction as data-generating activity while the user experiences it as communication, work, entertainment, or social participation. The same relation can therefore occupy different places in the reproduction of each subject.

This asymmetry of significance is analytically important. Economic relations cannot always be understood by assigning the same type of variable to each side. The relation may link subjects whose persistence conditions are fundamentally different. One participant can exit with limited consequence while another loses access to income, identity, infrastructure, or social connection. GRE analysis should therefore specify what the relation does for each subject, which capacities it supports, which vulnerabilities it exposes, and how these differences affect bargaining, interpretation, and future generation.

Heterogeneous subjects can nevertheless form stable relations. Stability may arise through law, trust, standards, routines, contracts, technical interfaces, conventions, organizational design, or repeated adaptation. The existence of such stability shows that shared subject form is not a prerequisite for economic relation. What matters is whether the relation contains sufficiently compatible interfaces for action, interpretation, and expectation within the domain that must be coordinated.

3.15.2 Heterogeneous Forms of Intelligence

Economic analysis often speaks of information, knowledge, skill, and rationality as though intelligence were a single capacity that subjects possess in greater or lesser amounts. GRE treats intelligence more cautiously. Different subjects can exhibit different forms of problem solving, inference, adaptation, memory, perception, coordination, judgment, and representation. These forms may be partly comparable for a

defined task without being reducible to one general economic scale.

Human economic intelligence includes dimensions that are difficult to separate cleanly: practical know-how, embodied familiarity, social interpretation, linguistic competence, moral judgment, imagination, aesthetic discrimination, memory, emotional response, and the capacity to act under incomplete and ambiguous conditions. Collective subjects can display organizational intelligence that no member possesses individually, including routines, distributed expertise, institutional memory, and coordinated response. Computational systems can display high performance in search, optimization, prediction, generation, classification, or symbolic transformation while relying on infrastructures, training processes, objectives, interfaces, and external forms of validation that structure what their outputs mean and how they are used.

Task-specific comparison is therefore often more informative than a universal ranking. One system may outperform another at high-dimensional pattern recognition while performing poorly where contextual interpretation, embodied judgment, accountability, or long-horizon institutional memory is decisive. An expert organization may coordinate a complex regulatory process effectively while responding slowly to unfamiliar technological change. A local community may possess detailed ecological knowledge that is poorly represented in standardized datasets. Heterogeneous intelligence appears as differentiated capability profiles rather than as a single ladder.

This matters economically because different forms of intelligence can become complementary. A relation can generate value precisely because participants perceive or process different features of a problem. Human–machine systems can combine computational scale with human contextual judgment. Interdisciplinary teams can connect different epistemic traditions. Firms can coordinate specialized units whose local knowledge would be insufficient in isolation. Markets themselves can sometimes coordinate dispersed information without requiring any participant to possess a complete representation of the system.

Complementarity, however, does not eliminate power. The party that controls the interface among forms of intelligence can shape which outputs count, which errors are visible, which judgments are overridden, and which forms of knowledge become economically legible. Standardization can facilitate coordination while devaluing tacit or local knowledge. Automated decision systems can increase processing capacity while concentrating control over model design, data, thresholds, or appeals. The governance of heterogeneous intelligence is therefore partly a problem of interface design and partly a problem of institutional power.

GRE should accordingly distinguish capability difference from epistemic authority. Superior performance in one domain does not automatically justify decision authority in another. Prediction accuracy does not itself settle normative legitimacy. Computational scale does not settle interpretive authority. Human status does not guarantee technical competence. A mature analysis asks which form of intelligence is relevant to which claim, what evidence supports its reliability, how different forms are combined, and who controls the terms of combination.

3.15.3 Heterogeneous Temporalities

Economic subjects also inhabit different temporal structures. Temporal heterogeneity concerns differences in pace, horizon, persistence, delay, memory, reversibility, and the timing through which consequences become visible. These differences can be as consequential as differences in resources or capability because a relation that is sustainable at one temporal scale can be destructive at another.

Individuals often make decisions under lifetimes measured in decades, daily needs measured in hours, and contractual obligations measured in months or years. Firms may evaluate projects through reporting cycles, investment horizons, product lifecycles, or expectations concerning market entry and exit. Public institutions can operate through electoral, budgetary, legal, and infrastructural timescales. Financial systems can react within milliseconds while housing, education, ecological restoration, demographic change, and institutional trust can unfold over decades. Artificial systems can process and update representations rapidly while the social institutions required to evaluate, regulate, or contest their deployment move more slowly.

Temporal heterogeneity creates coordination problems. A rapidly adjusting actor can repeatedly change strategy before a slower institution completes review. Short-term financial incentives can conflict with long-term maintenance or ecological resilience. A policy may generate immediate benefits while degrading capacities that become visible only years later. Conversely, insisting on very long evaluation horizons can leave urgent present vulnerabilities insufficiently addressed. No single time horizon is automatically privileged across all economic questions.

GRE therefore treats temporal alignment as an analytical problem. Contracts, standards, insurance, reserves, review periods, waiting times, sunset clauses, intergenerational institutions, and adaptive governance can all be understood partly as devices for coordinating subjects whose consequences and capacities unfold at different rates. Such devices do more than schedule action. They distribute whose temporality receives priority. A deadline can privilege the actor able to mobilize quickly. A long approval process can protect against irreversible harm while disadvantaging subjects facing immediate need. A quarterly reporting regime can orient organizations toward measurable near-term outputs at the expense of slower generative effects.

Temporal heterogeneity also complicates attribution. A downstream effect may emerge long after the originating intervention, after intermediate relations have changed and after responsible institutions or personnel have disappeared. Conversely, a long-standing structure can condition present action without appearing in short observational windows. GRE analysis should therefore state the temporal horizon of its claims and examine whether the relevant mechanism operates faster or slower than the data used to identify it.

Coexistence across heterogeneous temporalities requires more than synchronization. Some differences should remain. Ecological regeneration cannot necessarily be accelerated to match financial expectations. Human deliberation may require time that automated processing does not. Institutional due process can be intentionally slower than market reaction. The governance question is therefore which temporal differences should be bridged, which should be protected, and how costs created by temporal mismatch are distributed.

3.15.4 Heterogeneous Vulnerabilities

Subjects differ not only in what they can do but also in what can harm them, how quickly harm occurs, how visible it is, and how readily recovery is possible. Vulnerability heterogeneity concerns these differentiated exposures and recovery conditions. It is especially important because relations that appear symmetric in formal terms can create highly asymmetric consequences when participants have different capacities to absorb loss.

The same monetary loss can be marginal for one subject and existential for another. A temporary service interruption can inconvenience a large organization while eliminating a small firm's only route to customers. Delayed payment can be a minor accounting issue for a well-capitalized buyer and a liquidity crisis for a supplier. Exposure of personal information can create embodied or social risks for an individual that have no equivalent in the experience of an automated system. Environmental degradation can affect communities whose livelihoods depend directly on local ecosystems while remaining abstract in the accounting of distant investors.

Vulnerability is therefore relational and domain-specific. A subject can be highly capable in one domain and vulnerable in another. Large firms can possess extensive resources while depending critically on specific infrastructure or regulatory permissions. States can exercise coercive authority while remaining technologically dependent. Artificial systems can be operationally powerful yet dependent on electricity, hardware, data centers, network access, maintenance, and human authorization. Vulnerability analysis should identify the failure conditions that matter for the particular relation rather than infer resilience from general size or capacity.

Recovery is as important as exposure. Two subjects exposed to the same disturbance can differ in reserves, insurance, social support, legal recourse, substitutability, repair knowledge, or access to alternative relations. These differences affect bargaining because the subject that can survive delay or failure usually possesses greater strategic freedom. Exit asymmetry, discussed in the previous section, is one expression of this wider vulnerability structure.

GRE also asks how relations generate vulnerability over time. Specialization can increase efficiency while producing dependence on narrow supply chains. Platform participation can expand market access while making future income dependent on ranking systems or account continuity. Debt can finance productive capacity while increasing sensitivity to interest rates or income interruption. An ecological intervention can raise present output while reducing resilience to later shocks. Vulnerability is therefore often produced jointly with value.

Governance under heterogeneous vulnerability should not assume that formally equal treatment produces equivalent protection. Uniform rules can distribute risk unequally when participants have different failure thresholds. At the same time, vulnerability should not be used as a permanent identity that freezes subjects into protected categories. The analytical task is to identify specific exposure, consequence, recovery capacity, and the mechanisms through which the relation modifies them.

3.15.5 Heterogeneous Value Structures

Economic coexistence frequently connects subjects that organize value differently. Value heterogeneity includes differences in what is valued, how value is recognized, which trade-offs are acceptable, what temporal horizon matters, what forms of loss are considered substitutable, and which goods are treated as inappropriate for exchange. GRE therefore treats value structure as plural rather than assuming that all relevant evaluation can be represented through a single utility, price, welfare index, or scalar measure.

Some values are readily expressed through monetary exchange because institutions already provide stable units, markets, contracts, and accounting conventions. Others are represented through rights, duties, thresholds, rankings, narratives, professional norms, ecological indicators, cultural meanings, or qualitative judgments. A community may value continuity of place in ways poorly represented by compensation for relocation. A worker may value autonomy, recognition, security, or meaningful participation alongside income. A public institution may be bound by legality and equal treatment even where another arrangement would reduce cost. Ecological relations can involve irreversibility, species loss, or system resilience that resists straightforward substitution.

Heterogeneous value structures do not imply that coordinated decision is impossible. Institutions routinely make decisions under plural values. They use budgets together with rights constraints, technical standards, minimum thresholds, deliberation, priority rules, side constraints, multicriteria evaluation, and negotiated settlements. These devices are forms of practical ordering rather than proof that all underlying values have become commensurable.

This distinction between ordering and commensurability is central. A decision can select one option without establishing a universal measure that converts every relevant value into a common unit. A legal prohibition can exclude some options before cost comparison begins. A safety threshold can structure a feasible set without pricing every possible injury. Negotiation can produce agreement acceptable to different parties for different reasons. GRE can analyze these arrangements as relational mechanisms for coordinating value heterogeneity.

Value heterogeneity also creates power questions. The institution that chooses the metric can privilege values that fit that metric. Monetary valuation can make some losses legible while rendering others peripheral. Quantitative indicators can improve transparency while narrowing attention to what is measurable. Expert vocabularies can facilitate comparison while excluding affected participants whose reasons are expressed differently. The politics of value therefore includes the design of representation and conversion rules.

GRE evaluation should preserve this plurality where it is substantively real. Scalar measures remain useful where a common measure is justified, but they should not acquire authority merely because they simplify optimization. When values are only partially commensurable, the analysis should record the remaining plurality rather than treating it as noise around a preferred metric.

3.15.6 Partial Mutual Intelligibility

Heterogeneous subjects rarely understand one another completely. Their categories, temporal horizons, sensory access, institutional roles, languages, models, and value structures can differ. Yet complete mutual understanding is not required for economic relation. Partial mutual intelligibility refers to the degree of shared interpretation sufficient for a defined form of coordination while leaving other aspects of the participants' worlds untranslated.

A buyer and seller can agree on quantity, quality, price, and delivery without sharing the same reasons for valuing the transaction. Organizations from different legal cultures can cooperate through contracts and technical standards while retaining different institutional assumptions. Humans can use computational systems whose internal representations they do not fully reconstruct, provided interfaces, validation procedures, and accountability arrangements make the relevant outputs sufficiently interpretable for the task. Scientific and local knowledge systems can sometimes coordinate around observable indicators while interpreting causal significance differently.

Partial intelligibility is therefore often produced by interfaces. A contract translates complex intentions into enforceable obligations. A standard reduces heterogeneous production processes to specified performance criteria. An API enables computational systems built on different internal architectures to exchange defined messages. A price compresses information relevant to exchange while leaving many reasons and consequences outside the transaction. A legal category makes different cases administratively comparable while suppressing detail. These interfaces enable relation precisely by limiting what must be mutually understood.

The reduction involved in an interface can be productive, but it can also generate misrecognition. When the interface omits a difference that later becomes consequential, coordination can fail. A metric can appear shared while participants interpret it differently. A model output can be operationally accepted without agreement on its epistemic status. A standardized category can group subjects whose vulnerabilities diverge sharply. The existence of a functioning interface therefore does not establish deep mutual understanding.

GRE analysis should ask what must be intelligible for the relation to function and what remains opaque. It should also ask who bears the risk created by opacity. If one party can demand explanation while the other cannot, interpretive asymmetry can become power. If a computational system influences access to credit, employment, or public services, the intelligibility required for legitimate use can be greater than the intelligibility required merely for technical operation.

Partial mutual intelligibility offers a middle position between two unrealistic assumptions: complete transparency and complete incommensurability. Economic life often proceeds through workable but incomplete translations. The quality of coexistence depends on whether these translations are sufficient for the stakes involved, revisable when they fail, and governed in ways that distribute interpretive risk fairly.

3.15.7 Economic Relations without Full Commensurability

Economic relation does not require every relevant object, value, subject, or consequence to be representable on one common scale. Exchange itself can involve commensuration for a limited purpose while broader aspects of the relation remain incommensurable. GRE therefore distinguishes local comparability from full commensurability.

A wage places a monetary value on labor time for the purpose of employment, but it does not establish that income exhausts the value of work, identity, health, autonomy, or social recognition. Insurance can assign compensation schedules to losses without implying that the compensated state is equivalent to the pre-loss state. Environmental markets can price particular emissions or ecosystem services while leaving cultural, ecological, and intergenerational values only partially represented. Cost-benefit analysis can support a decision under specified assumptions without becoming a complete theory of value.

Relations under incomplete commensurability often rely on layered decision rules. Some dimensions are priced. Others are protected through rights or prohibitions. Some are represented through minimum standards, negotiated conditions, or procedural safeguards. Others remain open to qualitative judgment. Such layered arrangements can be analytically messy, but the mess may reflect genuine plurality rather than methodological failure.

GRE can therefore study conversion without assuming equivalence. A value can be converted into another form through an institution even when the conversion is contested or incomplete. Time can be converted into wages; attention into advertising revenue; reputation into credit access; ecological damage into compensation obligations; research prestige into funding opportunity. The existence of a conversion mechanism shows that a relation connects the forms. It does not prove that the forms are intrinsically equivalent.

This distinction helps analyze exploitation and loss. When an institution repeatedly converts one form of value into another under asymmetric terms, the question is not only how much is transferred but which dimensions disappear during conversion. A platform can monetize social interaction while leaving users with limited claims on the resulting economic value. A development project can compensate property loss while failing to restore community networks. A labor contract can pay for output while externalizing health or care burdens. In each case, commensuration can enable exchange while concealing residual effects.

Coexistence under plural values therefore requires institutional creativity. Markets are one mechanism among several. Deliberation, commons governance, public provision, professional standards, rights, mutual aid, licensing, quotas, thresholds, and hybrid arrangements can coordinate heterogeneous values in different ways. GRE does not presume in advance which mechanism is appropriate. It asks how the chosen mechanism makes some values comparable, leaves others outside comparison, distributes authority over conversion, and alters future possibilities.

3.15.8 Human–AI Relations as a Contemporary Case

Human–AI relations provide a contemporary case in which heterogeneity of subject form, intelligence, temporality, vulnerability, and value can appear simultaneously. GRE can analyze these relations without first resolving philosophical questions about machine consciousness or personhood. The immediate economic question is how human and artificial operational subjects become connected through production, decision, communication, ownership, infrastructure, and institutional authority.

The asymmetry is multidimensional. Artificial systems can process or generate large volumes of symbolic material rapidly, replicate outputs at low marginal cost, and operate continuously within suitable infrastructure. Humans retain forms of embodiment, lived vulnerability, social membership, legal standing, moral responsibility, contextual experience, and value formation that are not established by computational performance. Organizations often mediate between the two, determining data access, deployment goals, review procedures, liability, and the distribution of gains.

This heterogeneity creates complementary possibilities. Artificial systems can extend search, translation, drafting, prediction, pattern recognition, or simulation. Human participants can contribute contextual interpretation, problem selection, normative judgment, embodied knowledge, accountability, and decisions concerning what purposes should be pursued. The generative question is how the relation changes the capabilities of both the immediate participants and the surrounding institutions.

It also creates new dependencies. Workers can become dependent on tools they do not control. Organizations can become dependent on model providers, computational infrastructure, or proprietary interfaces. Users can rely on systems whose update cycles alter behavior faster than institutional procedures adapt. Expertise can shift from producing outputs directly to evaluating, directing, integrating, or contesting machine-generated outputs. These changes can redistribute bargaining power even when aggregate productivity rises.

Human–AI coexistence therefore should not be analyzed through replacement alone. Substitution is one possible relation. Others include complementarity, supervision, delegation, contestation, infrastructural dependence, mutual adaptation, and reorganization of occupational or institutional roles. The relevant GRE object is the evolving relational configuration: who controls the system, who defines objectives, who bears error, who receives generated value, which human capacities are strengthened or weakened, and how future alternatives are shaped.

The case also clarifies partial mutual intelligibility. Humans may use outputs without understanding every internal computational process, while artificial systems operate on representations that do not amount to human understanding in any straightforward sense. Economic coordination can nevertheless occur through interfaces, tests, standards, feedback, and institutional review. The adequacy of that partial intelligibility should depend on stakes. A low-risk drafting aid and a system affecting liberty, livelihood, healthcare, or public authority require different evidential and governance conditions.

GRE therefore treats human–AI relations as an important contemporary domain of heterogeneous coexistence, while maintaining ontological and normative caution.

Operational capability does not settle personhood. Performance difference does not settle moral status. Economic usefulness does not settle legitimacy. These questions remain connected but analytically distinct.

3.15.9 More-than-Human and Ecological Relations

Economic systems also coexist with organisms, ecosystems, climatic processes, material cycles, and other more-than-human structures whose dynamics are constitutive of production and life. GRE includes these relations because economic generation depends on ecological and material conditions even when those conditions are poorly represented by conventional economic subjects.

More-than-human analysis requires ontological care. A forest, river, species, or ecosystem need not be treated as a subject in exactly the same sense as a human person or organization for its relational role to be economically consequential. Ecological systems can impose constraints, provide capacities, absorb waste, regenerate resources, transmit disturbances, and respond to interventions through dynamics that exceed the intentions of economic actors. Some legal or cultural traditions may also recognize nonhuman entities through forms of representation or standing. GRE can study these arrangements without requiring one universal theory of nonhuman subjecthood.

Ecological heterogeneity is strongly temporal. Soil formation, forest succession, hydrological cycles, species recovery, and climate processes can unfold at rates that differ from market, budgetary, and political cycles. An economic system can therefore appear productive within a short window while drawing down slower regenerative capacities. Conversely, ecological protection can impose immediate costs while preserving long-horizon generative conditions. The choice of temporal scale becomes part of evaluation rather than a neutral technical setting.

Vulnerability is likewise heterogeneous. An industrial actor may be able to relocate while a local ecosystem cannot. A community may depend on a specific river or coastal system whose loss is not replaceable by monetary compensation. Species and ecological processes can cross thresholds beyond which recovery becomes difficult or impossible on humanly relevant timescales. These differences complicate models that assume reversible substitution among resources.

Partial intelligibility appears here as well. Human institutions do not fully observe ecological systems. Models, indicators, monitoring networks, local knowledge, and scientific interpretation provide partial representations. Intervention therefore occurs under uncertainty about feedback, thresholds, and delayed effects. GRE's epistemic commitments require the distinction between ecological reality and its representation to remain explicit, especially where uncertainty interacts with potentially irreversible change.

The economic question is how relations with more-than-human systems affect present and future capacities. Extraction, cultivation, conservation, restoration, pollution control, infrastructure, and land-use rules all modify ecological conditions from which later economic possibilities emerge. More-than-human coexistence is thus central to generative analysis because the future economy is partly generated through relations with systems that exceed the boundaries of human institutions.

3.15.10 Boundary Cases of Radically Different Subjects

The most demanding cases for GRE arise when participants differ so substantially that ordinary assumptions of shared preference, common language, reciprocal recognition, or comparable vulnerability become unreliable. These boundary cases may involve relations among human communities with sharply different ontologies, future artificial systems with unfamiliar forms of agency, interspecies relations, intergenerational relations in which one party is not yet present, or institutional interactions with ecological systems that cannot participate in negotiation in conventional terms. The purpose of considering such cases is not to classify every entity as a subject. It is to test which parts of GRE remain usable when mutual similarity is minimal.

The first requirement is to separate relation from reciprocity. A subject or system can be economically affected by another without being able to respond in the same channel. Future generations can bear consequences of present debt, infrastructure, ecological damage, and knowledge preservation without participating in present bargaining. Nonhuman systems can constrain or respond to economic activity without expressing preferences through markets or language. An artificial system can alter human opportunities while its own status as a bearer of interests remains unsettled. Economic relation can therefore exist under asymmetric capacities for representation and response.

The second requirement is representational humility. When one side cannot articulate its interests through the dominant institutional interface, another actor often speaks on its behalf. Guardians, regulators, scientific experts, community representatives, trustees, legal advocates, or technical proxies can perform this role. Representation may be necessary, but it creates a second-order relation in which the representative's categories can shape what becomes visible. GRE analysis should therefore examine not only the represented subject or system but also the institutions that authorize, translate, and contest representation.

The third requirement is to distinguish coordination from assimilation. Radically different subjects need not become similar in order to coexist. Governance can instead create protected distances, limited interfaces, non-interference rules, thresholds, buffer zones, rights, or protocols that make coexistence possible while preserving difference. In some cases the appropriate relation is closer integration; in others it may be separation or restriction of contact. GRE does not prescribe one universal form of coexistence because the relevant vulnerabilities, values, and generative effects differ.

Boundary cases also expose the limits of commensuration. Where interests or values cannot be credibly translated into one metric, decision may require procedural legitimacy, precaution, rights, representation, plural evaluation, or explicit acknowledgment of unresolved disagreement. A decision can still be made, but the residual disagreement remains part of the record rather than disappearing into a scalar result. This is especially important where the affected party cannot later recover from the imposed decision.

The broader constitutional implication is that GRE should be able to study economies composed of heterogeneous forms without making homogeneity a hidden precondition of analysis. Economic relation can persist through partial intelligibility,

bounded interfaces, heterogeneous values, differentiated temporalities, unequal vulnerabilities, and incomplete commensurability. The task is to identify which differences matter to the relation, which interfaces make coordination possible, which conversions obscure residual losses, and how the terms of coexistence alter future generative possibilities.

Heterogeneity therefore belongs inside the GRE problem-space rather than at its margins. It prevents the economic subject from being silently standardized, prevents intelligence from being reduced to one ranking, prevents temporality from being treated as uniform, prevents vulnerability from being inferred from formal equality, and prevents value from being collapsed into a single measure. It also provides a bridge to the next constitutional problem. Once GRE accepts heterogeneous forms as legitimate participants and objects of inquiry, it must state more precisely where its own disciplinary boundaries lie and how it relates to neighboring economic and social-scientific traditions. The following section therefore turns to the boundaries of Generative Relational Economics.

3.16 Boundaries of Generative Relational Economics

Generative Relational Economics is intended to remain intellectually permeable without becoming disciplinarily indeterminate. The role of this section is to specify the principal boundaries through which GRE relates to neighboring economic and social-scientific traditions while preserving a recognizable problem-space of its own. Its objective is neither to rank adjacent approaches nor to absorb them into a single synthesis. Instead, the section clarifies where GRE can borrow concepts, methods, evidence, and explanatory mechanisms; where genuine overlap exists; and where a distinction should be maintained because the neighboring tradition asks a different primary question, uses a different evaluative register, or makes commitments that GRE does not need to adopt. The discussion proceeds through mainstream economics, political economy, relational economics, economic sociology, complexity economics, evolutionary economics, capability approaches, ecological and regenerative economics, generative justice, and general Generative Relational Theory. The method is boundary-setting rather than genealogical. Chapter 2 reconstructed intellectual lineages; the present task is to define interfaces for an emerging research programme.

A disciplinary boundary in this sense is not a wall. GRE can use optimization, causal inference, institutional analysis, network models, historical interpretation, capability concepts, ecological accounting, or justice-oriented evaluation whenever those tools are appropriate to the claim under investigation. The boundary concerns the conditions under which such borrowing remains intelligible. A borrowed method does not make a study identical with the field from which that method came, and a shared object does not erase differences in analytical emphasis. Firms, households, technologies, institutions, ecosystems, capabilities, and power can all be studied by several traditions at once while being rendered differently by each.

This openness is necessary because many GRE questions are intrinsically composite. A study of platform labor may require conventional price and labor-market analysis, institutional and legal interpretation, network structure, computational measure-

ment, political-economic analysis of control, and normative evaluation of capability or dependency. A study of agricultural transition may require cost and productivity analysis, ecological constraints, household reproduction, institutional history, technological coevolution, and long-horizon generative effects. GRE contributes when the inquiry asks how relations among these elements generate, distribute, stabilize, transform, or foreclose later capacities and possibilities. It does not require every neighboring perspective to be translated into GRE terminology.

Boundary maintenance therefore serves two purposes. First, it protects GRE from conceptual inflation. If every relational, dynamic, institutional, or justice-oriented economic study were automatically classified as GRE, the programme would lose analytical content. Second, it protects neighboring fields from retrospective appropriation. GRE can inherit and recombine resources while acknowledging that those resources have their own histories, standards, and unresolved debates. The disciplinary identity developed in this chapter depends on dialogue without theoretical identity.

3.16.1 GRE and Mainstream Economics

GRE has no constitutive need to define itself through opposition to mainstream economics. Standard economic analysis contains powerful tools for studying prices, incentives, choice under constraints, equilibrium, strategic interaction, causal effects, welfare consequences, production, and allocation. Where a research problem is adequately specified by those objects, GRE gains little by redescribing the same analysis in relational vocabulary. The boundary is therefore positive: GRE becomes useful when the research question concerns how the relevant preferences, capacities, constraints, institutional positions, relations, or future opportunity sets are themselves generated and transformed through economic processes.

This distinction can be stated through analytical depth rather than disciplinary hierarchy. A conventional model may treat preferences as given over the horizon of analysis. GRE can accept that local simplification when preference formation is irrelevant to the question. A different study may need to explain how advertising, institutions, peer relations, platform design, education, or repeated participation reshape preferences or salience. In that setting, what was reasonably exogenous in the first model becomes an object of inquiry. The same logic applies to technology, endowments, legal categories, information structures, capabilities, and market boundaries.

Equilibrium analysis provides another example. GRE does not reject equilibrium as a mathematical or empirical concept. A stable or approximately stable configuration can be analytically important. The additional GRE question concerns what relations sustain the configuration, how the stability distributes capacities and vulnerabilities, whether the configuration generates new conditions that alter its own persistence, and what happens when the relevant state space or institutional rules change. Equilibrium can therefore appear within GRE without defining the whole research programme.

The relation is similarly complementary in empirical work. Econometric identification, experimental design, structural estimation, administrative data analysis, and causal inference can provide strong evidence for particular mechanisms or effects.

GRE should use such evidence where available and should not substitute relational prose for identification. At the same time, an estimated local causal effect does not automatically reveal downstream institutional transformation, changing subject positions, altered exit conditions, or long-run generative consequences. Those further claims require further evidence.

The boundary can thus be summarized in terms of problem selection. Mainstream economics often provides the strongest available analysis when the relevant agents, constraints, preferences, technologies, and institutional rules can be treated as sufficiently stable. GRE becomes especially relevant when those conditions are part of what must be explained. The relationship is therefore one of selective extension and mutual correction rather than displacement.

3.16.2 GRE and Political Economy

GRE overlaps substantially with political economy because both can treat economic outcomes as inseparable from institutions, power, historical formation, distribution, and collective organization. Questions concerning ownership, labor, state capacity, financial structure, class, technological control, colonial legacies, regulation, and asymmetric dependence are naturally shared terrain. GRE does not need a separate vocabulary when political economy already provides an adequate account of the relevant mechanism.

The principal difference lies in analytical center of gravity. Political economy frequently organizes inquiry around the distribution and exercise of power among classes, states, firms, institutions, or social groups. GRE includes these objects but asks an additional family of questions concerning what those relations generate over time: capacities, subject positions, dependencies, values, institutional pathways, representational structures, ecological conditions, and the possibility of later action. Power remains central, yet GRE does not make every economic relation reducible to power.

This distinction matters because a relation can be generatively important even when domination is weak or absent. Cooperative institutions can generate capabilities and norms. Public infrastructure can create new spaces of participation. Educational systems can alter the subjects capable of entering later markets or political processes. Technological standards can coordinate activity without being explainable primarily through coercion. Political-economic analysis may already address these effects; GRE emphasizes their generative structure as a recurring cross-domain problem.

Conversely, GRE should not dilute political-economic mechanisms by translating them into neutral language of relation. Ownership, coercion, exclusion, dispossession, monopoly, dependency, and state authority possess specific institutional and historical content. When such mechanisms explain an outcome, they should be named directly. Relational vocabulary is not a substitute for analyzing who controls resources, who bears risk, who sets rules, or who can credibly exit.

GRE therefore sits near political economy while preserving a broader generative question. It can investigate how power structures generate future inequalities and institutional lock-in, but it can also study relations of learning, cooperation, care, eco-

logical reproduction, or symbolic orientation whose economic importance is not exhausted by power. The boundary allows GRE to inherit political economy's seriousness about history and asymmetry without treating political-economic conflict as the sole grammar of economic generation.

3.16.3 GRE and Relational Economics

The strongest conceptual overlap may appear between GRE and approaches that explicitly place relations at the center of economic analysis. Relational economics, relational goods, network-based economic analysis, and other relation-sensitive traditions already challenge the assumption that economic value and behavior can always be understood through isolated individuals and possessed objects. GRE shares the view that access, interaction, recognition, coordination, dependency, and participation can be economically constitutive.

The boundary arises from the second term in the name: generative. GRE is interested not only in the existence or quality of relations but also in what relations bring into being, reproduce, transform, or foreclose. A relation can connect already-defined actors, but it can also alter their capabilities, identities, institutional positions, preferences, expectations, and future relations. The analytical question moves from the structure of a relation to the consequences of participating in and reproducing that relation.

This distinction prevents a relation-first approach from becoming static. Two networks can share similar topology while differing in what their ties generate. Two contractual arrangements can appear similar at one moment while producing different long-term capabilities or dependencies. A cooperative relation can initially create shared capacity and later become exclusionary. A market relation can transmit value while also changing the conditions under which future exchange occurs. GRE therefore requires temporal and generative specification beyond identifying relational structure.

At the same time, GRE does not claim that every relation generates deep transformation. Many relations may be transient, weak, or analytically negligible for the research question. The researcher must establish which relations matter, through which mechanisms, and over what horizon. Relation itself is not an explanatory endpoint.

The boundary with relational economics is thus narrow but meaningful. GRE belongs naturally within a wider family of relational economic approaches, while adding a systematic focus on downstream generation, recursive transformation, heterogeneous forms of value, changing subjects, and future possibility. That addition should be treated as a research orientation rather than as a claim that earlier relational work failed to recognize change or emergence.

3.16.4 GRE and Economic Sociology

Economic sociology provides many of the concepts required for GRE to avoid an overly thin account of economic action. Institutions, social networks, conventions, organizations, classifications, trust, status, embeddedness, cultural interpretation, and

collective identity can all shape what economic relations are possible and how they are understood. GRE therefore shares a substantial empirical and conceptual domain with economic sociology.

The boundary is not based on a sharp separation between "economic" and "social" facts. GRE rejects such a simple partition. The distinction is better located in the organizing research problem. Economic sociology can ask how markets, firms, money, organizations, or valuation are socially constituted. GRE can use those analyses and then ask how the resulting economic relations transform later capacities, values, constraints, subject positions, and structures of possibility. The two directions can be mutually reinforcing.

GRE also retains an explicitly economic concern with allocation, production, circulation, extraction, capability, scarcity, and the organization of resources. These objects prevent the programme from dissolving into a general sociology of relations. A sociological account of trust may explain why exchange becomes possible; GRE may further analyze how the exchange redistributes capacity, creates dependency, alters future bargaining positions, or changes the institutions that sustain trust. A sociological account of classification may explain category formation; GRE may examine how that classification changes access to credit, work, insurance, mobility, or recognition.

This interface is especially important for symbolic and representational objects. Prices, ratings, credentials, risk scores, categories, and rankings can be both social facts and economic mechanisms. GRE can study their generative effects without claiming that economic sociology is merely a precursor to GRE. The traditions differ in disciplinary history and in the questions they prioritize.

The boundary therefore remains porous. GRE depends on sociological evidence whenever economic relations are constituted by social meaning, institutional recognition, or organizational form. It remains recognizably economic when the inquiry centers on how such relations organize resources, capacities, value, scarcity, exchange, production, and future economic possibility.

3.16.5 GRE and Complexity Economics

Complexity economics and GRE share an interest in heterogeneous agents, nonlinearity, adaptation, path dependence, interaction effects, emergent macro-patterns, and systems that change outside simple equilibrium descriptions. Complexity methods can be especially valuable when aggregate outcomes arise from distributed interactions and when feedback alters the trajectory of the system.

The overlap is methodological as well as conceptual. Agent-based models, network models, simulation, nonlinear dynamics, and computational experiments can all contribute to GRE where the research problem is compatible with their assumptions. These tools allow researchers to study distributed generation, threshold effects, coordination, cascading change, and multiple possible trajectories.

GRE nevertheless remains broader than a complexity methodology. A GRE contribution need not contain a simulation, a network model, or a nonlinear formal system. Historical interpretation, institutional analysis, qualitative research, comparative case studies, legal analysis, causal inference, and participatory inquiry can all

be appropriate. Complexity is one representational and explanatory family among several.

A second boundary concerns the representation of emergence. A computational model can demonstrate how a macro-pattern emerges from specified micro-rules. That result is important, but it establishes emergence within the model. GRE must still ask whether the selected agents, rules, state variables, and interactions adequately represent the empirical process. It may also need to explain how the rules themselves were historically generated, interpreted, contested, or transformed.

A third boundary concerns normativity and meaning. Complex adaptive behavior can persist without being desirable. A resilient system can stabilize exclusion, ecological harm, or domination. Actors can interpret the same rule differently, and those interpretations can alter later action. GRE therefore combines complexity-sensitive analysis with explicit attention to historical meaning, institutional authority, heterogeneous value, and normative evaluation.

The relationship is consequently close but non-identical. Complexity economics supplies powerful tools for distributed and nonlinear generation; GRE adds a wider methodological repertoire and makes the generation of rules, subjects, meanings, and evaluative conditions available as research objects where evidence permits.

3.16.6 GRE and Evolutionary Economics

Evolutionary economics offers another close interface because it treats economic systems as historically changing populations of technologies, routines, organizations, practices, and institutions. Innovation, variation, selection, retention, path dependence, learning, and coevolution provide important resources for analyzing processes that cannot be reduced to static optimization.

GRE shares the historical and processual orientation while avoiding an automatic translation of every generative process into evolutionary terms. Generation can occur through variation and selection, but it can also arise through deliberate institutional design, legal reclassification, collective interpretation, negotiated coordination, education, care, public investment, conflict, or sudden technological recombination. Evolutionary mechanisms are therefore important members of a broader generative repertoire.

The distinction is also useful for normative analysis. Persistence or selection does not demonstrate efficiency, justice, desirability, or superior adaptive value in every relevant sense. Institutions can survive because alternatives are suppressed, switching costs are high, incumbents control infrastructure, or vulnerable groups bear the costs of persistence. GRE therefore treats selection outcomes as explanatory objects that may require separate normative evaluation.

Coevolution provides particularly fertile common ground. Firms and technologies, institutions and practices, infrastructures and habits, or policies and expectations can change in mutually conditioning ways. GRE extends the question when the process changes the kinds of subjects, capacities, value forms, or relations that can exist in the next period. The interest lies not only in reciprocal adaptation but in transformation of the conditions under which later adaptation occurs.

GRE can thus use evolutionary models and concepts whenever variation, selection, retention, innovation, and coevolution explain the empirical process. Its boundary lies in refusing to make those mechanisms exhaustive. The programme remains open to generative processes whose historical logic is interpretive, institutional, juridical, ecological, political, or deliberately designed rather than primarily evolutionary.

3.16.7 GRE and Capability Approaches

Capability approaches and GRE share a concern with what people and other relevant subjects are substantively able to do and to become. This creates a natural interface between the evaluation of resources and the analysis of conversion conditions. Equal resources can produce unequal capabilities when subjects face different institutions, environments, social relations, embodied conditions, or access structures.

GRE adopts this insight without treating capability as its sole evaluative language. Capability is one dimension of generative consequence. Economic relations can generate or erode capabilities, but they can also transform dependency, recognition, institutional participation, relational quality, ecological conditions, symbolic orientation, and the possibility of collective action. Some of these effects can be translated into capability terms; others may be better preserved as distinct analytical objects.

The temporal orientation also differs in emphasis. Capability analysis can evaluate the substantive opportunities available at a given time. GRE places particular attention on how those opportunities were generated, how they are maintained, and how present relations alter the capability-generating conditions of the future. This makes capability formation, reproduction, concentration, and erosion central dynamic questions.

Capability asymmetry further enters the analysis of power. A difference in capability does not automatically create domination, but it can become leverage when one subject controls an infrastructure, knowledge resource, legal permission, computational system, or exit option required by another. GRE therefore connects capability analysis to relational conversion mechanisms without reducing capability to power.

The boundary is normative as well as analytical. GRE can use capability-oriented evaluation without claiming to settle the philosophical questions that capability theories address concerning freedom, human flourishing, lists of central capabilities, or the justification of public priorities. Those debates remain neighboring normative resources. GRE's contribution is to investigate how economic relations generate and distribute the conditions under which capabilities become possible, durable, or foreclosed.

3.16.8 GRE and Ecological and Regenerative Economics

Ecological and regenerative economics provide essential resources for any GRE analysis in which economic generation depends on material, energetic, ecological, or more-than-human conditions. Production cannot be understood solely through monetary circulation when it depletes soils, water, biodiversity, climate stability, or other conditions required for future activity. Conversely, economic relations can sustain and regenerate ecological capacities under some institutional arrangements.

GRE shares the emphasis on stocks, flows, throughput, ecological limits, interdependence, and long-horizon reproduction. It also shares the concern that apparent short-term gain can undermine the conditions of later possibility. Generative foreclosure has a direct ecological meaning when present extraction damages the ecological capacities through which future livelihoods or social systems could otherwise be sustained.

The boundary again concerns scope and normativity. GRE uses "generative" in a broader sense than ecological regeneration. A process can generate institutions, subject positions, knowledge, technological capacities, dependencies, or symbolic values while degrading ecological conditions. Conversely, ecological regeneration can occur within social arrangements that distribute benefits or burdens unjustly. The descriptive fact of regeneration therefore requires separate social and normative evaluation.

GRE also avoids treating circularity, resilience, regeneration, and generativity as synonyms. A circular material flow can preserve an unjust labor relation. A resilient system can stabilize harmful dependence. A regenerative ecological practice can impose burdens on communities whose knowledge or land is appropriated. The relevant analysis must specify what is being regenerated, for whom, through which relations, and with what consequences elsewhere.

The relationship is therefore strongly complementary. Ecological and regenerative economics prevent GRE from treating future possibility as socially generated in isolation from biophysical conditions. GRE contributes a wider account of how ecological and economic processes interact with institutions, power, subjects, value forms, and the distribution of future generative capacity.

3.16.9 GRE and Generative Justice

Generative justice is one of the closest normative neighbors of GRE because it directs attention to the circulation and return of generative value and to the conditions under which communities retain control over the processes that produce value. Earlier in the book, this lineage was treated as an established theoretical resource rather than as a retrospective expression of GRE. That distinction remains important at the disciplinary boundary.

GRE shares the concern that evaluation should extend beyond the immediate allocation of outputs. A relation can appear distributively acceptable at one moment while extracting the capacities, knowledge, infrastructures, or ecological conditions that enable future generation. Conversely, an arrangement can strengthen future capability by returning value, knowledge, authority, or productive infrastructure to the subjects and communities involved.

The two programmes nevertheless have different scope. Generative justice is explicitly normative. GRE combines descriptive, explanatory, causal, historical, formal, computational, normative, and intervention-oriented modes. A GRE study can analyze how value recirculates or is extracted without concluding that a particular pattern is just. Normative judgment requires additional premises concerning participation, domination, capability, harm, ecological sustainability, procedural legitimacy, plural values, and future possibility.

GRE also uses a wider conception of what may be generated. Material wealth and productive capacity are central, but economic relations can also generate subject positions, representations, institutional authority, dependencies, expectations, knowledge, ecological conditions, and future option structures. Return of value is therefore one important pattern among several possible generative trajectories.

The boundary preserves attribution and conceptual clarity. GRE can learn directly from generative justice while maintaining a broader economic research programme whose normative analysis remains open to several theories of justice and to the neighboring work of GREthic. The overlap is substantive, but theoretical identity would obscure differences in purpose and scope.

3.16.10 GRE and General Generative Relational Theory

The final boundary is internal to the wider research programme. General Generative Relational Theory provides the broader conceptual space in which relations, generation, ontological emergence, epistemic mediation, historical transformation, power, normativity, and praxis can be studied across domains. GRE is the economic instantiation of that wider framework. The distinction is necessary because not every generative-relational problem is an economic problem.

GRE therefore adopts only the amount of general GR required to investigate economic objects. It studies production, allocation, circulation, exchange, extraction, capability, scarcity, institutions, economic subjecthood, value, power, ecological dependence, and the transformation of future economic possibility. General GR may address analogous structures in law, politics, education, science, aesthetics, knowledge, culture, or other domains where the primary research problem is not economic.

This distinction prevents disciplinary expansion by analogy. A relational pattern discovered in economic analysis should not automatically be generalized to every social domain. Conversely, a concept developed in another GR domain may require translation before it becomes economically meaningful. The relevant mechanisms, evidence, units of analysis, institutions, and normative stakes can differ substantially across domains.

The relation is nevertheless recursive. GRE can contribute concepts and findings back to general GR. Economic studies may reveal new mechanisms of generative foreclosure, recursive power, value conversion, subject formation, or cross-scale transformation that later become useful outside economics. Other GR domains can likewise correct GRE by showing that an apparently economic process depends on legal, political, epistemic, cultural, or ecological structures that GRE alone cannot adequately explain.

General GR should therefore function neither as a doctrinal authority over GRE nor as a collection of metaphysical propositions that economic research is expected to confirm. It is a broader, revisable framework that can coordinate comparison among domains while remaining open to correction from domain-specific work. GRE retains disciplinary responsibility for the quality of its economic evidence and explanation.

The boundaries established across this section give GRE a position that is open without being unlimited. The programme can use mainstream economic models, political-

economic accounts of power, relational and sociological analyses, complexity and evolutionary methods, capability concepts, ecological and regenerative analysis, and generative-justice insights. None of these interfaces requires GRE to become identical with the neighboring field. The criterion is whether the borrowed resource helps explain how economic relations generate, reproduce, distribute, transform, or foreclose later capacities and possibilities.

This boundary-setting also prepares the next task of disciplinary constitution. Once GRE's neighboring interfaces have been identified, a further question becomes unavoidable: what would make a particular study count as a contribution to GRE rather than merely a study that uses relational language? The following section therefore turns from external boundaries to internal research standards, specifying the criteria by which a GRE contribution can state its relational problem, generative claim, evidence, boundary conditions, normative commitments, and cumulative contribution with sufficient clarity to be evaluated and revised.

3.17 Criteria for a GRE Research Contribution

The preceding sections have defined the problem-space, analytical objects, scales, modes of inquiry, epistemic commitments, praxis orientation, normative concerns, and disciplinary boundaries of Generative Relational Economics. A research programme, however, also requires internal standards by which particular studies can be recognized, criticized, compared, and accumulated. The role of this section is to state those standards. Its objective is neither to create a rigid checklist nor to police disciplinary membership through terminology. It is to specify the minimum analytical work required for a contribution to make a recognizably GRE claim. The discussion proceeds through ten criteria: specification of the relational problem; explicit scale and boundary conditions; identification of the generative claim; evidence appropriate to that claim; distinction between representation and relational reality; attention to downstream effects; consideration of alternative generative mechanisms; normative transparency; reproducibility and interpretive traceability; and contribution to cumulative knowledge. The method is constitutional and methodological. These criteria are intended to make GRE research more contestable, revisable, and cumulative rather than more doctrinal.

A study need not satisfy every criterion with the same intensity. A conceptual paper may contribute primarily through category formation and theoretical clarification. A historical study may establish a generative mechanism through archival reconstruction. An econometric study may identify a restricted causal relation while leaving wider ontological questions open. A simulation may explore the consequences of a specified generative mechanism without claiming empirical completeness. An intervention study may generate evidence about relational change that could not be obtained through detached observation alone. The relevant standard is proportionality: the claims made should be supported by an appropriate combination of analytical specification, evidence, and methodological transparency.

GRE therefore treats disciplinary contribution as a relation between a problem, a claim, a representation, evidence, and a cumulative research context. Relational vo-

cabulary alone does not establish that relation. A paper that describes a network, invokes emergence, or discusses downstream effects is not thereby a GRE contribution. The GRE character becomes substantive when the research shows how a specified economic relation contributes to the generation, reproduction, transformation, distribution, or foreclosure of later capacities, values, subjects, constraints, structures, or conditions of possibility, and when that claim is made in a form that other researchers can examine and revise.

3.17.1 Specification of the Relational Problem

A GRE contribution begins by specifying the relational problem under investigation. This requirement is stronger than stating that the topic is "relational." The study should identify which subjects, entities, institutions, infrastructures, representations, ecological conditions, or other analytically relevant configurations are connected, what kind of relation is at issue, and why that relation matters to the economic problem being studied.

The relation may involve exchange, production, financing, employment, ownership, access, dependence, coordination, classification, care, information, legal recognition, infrastructure use, platform participation, resource extraction, ecological dependence, or another economically consequential connection. Its empirical form may be contractual, informal, symbolic, technical, organizational, institutional, spatial, ecological, or distributed across several of these forms. GRE does not require a single taxonomy of relations. It requires enough specification for the researcher and reader to know what is being claimed to connect what.

Relational specification should also identify the economically relevant incidence of the relation. The administrative recipient of a resource, policy, payment, model, or intervention may be only one locus within a wider relational field. A subsidy to a firm can affect workers, suppliers, competitors, financial institutions, local communities, infrastructure demand, and future investment. A credit decision can affect households, landlords, employers, insurers, and later access to other services. A platform rule can alter users, complementors, advertisers, content producers, and labor conditions. The research problem becomes relational when these connections are treated as analytically constitutive rather than as residual externalities added after the main analysis.

The study should further clarify whether the relation is itself the principal object or whether it mediates another object of interest. A paper may examine the formation of a labor relation, the consequences generated through that relation, or the way the relation transforms its own future conditions. These are different research problems. Stating the relation precisely prevents a general language of interdependence from substituting for explanation.

Relational specification does not require exhaustive mapping. Every inquiry selects some relations and leaves others outside the active representation. The contribution lies partly in justifying why the selected relations are sufficient for the local question and in making visible which important relations have been bracketed. A study that names its relational problem clearly can later be extended, challenged, or re-scaled. A study that leaves the relation implicit is harder to evaluate because dis-

agreement about evidence can conceal disagreement about what the object actually is.

3.17.2 Explicit Scale and Boundary Conditions

Every GRE contribution should state the scale and boundary conditions within which its claims are intended to hold. Economic relations change character across temporal, organizational, spatial, institutional, ecological, and analytical scales. An apparent entity at one scale can decompose into heterogeneous relations at another. A mechanism visible in a household, firm, or platform may operate differently at sectoral, juridical, ecological, or transnational scales. Explicit scale selection therefore belongs to the substance of the analysis rather than to a technical appendix.

Boundary conditions specify what is treated as inside the active system of analysis, what is treated as an environment or background condition, and what is excluded. These boundaries can be geographical, institutional, temporal, jurisdictional, organizational, technological, ecological, or representational. They can also be nested. A study of a labor platform may define the platform ecosystem as the primary boundary while treating labor law, payment infrastructure, and macroeconomic conditions as surrounding systems that enter through specified interfaces.

Temporal boundaries require particular care because generative effects can be delayed. An intervention that raises income over six months may reduce a productive or ecological capacity over five years. A technology that expands access in one period can create dependence on proprietary infrastructure later. A relational configuration that appears stable during one institutional regime may dissolve when law, prices, expectations, or political authority change. A GRE contribution should therefore identify the temporal horizon of the claim and, when appropriate, distinguish immediate effects from slower structural or generative transformations.

Explicit boundary conditions also constrain generalization. Evidence from one sector, jurisdiction, historical period, or technological architecture does not automatically establish the same mechanism elsewhere. A GRE study can make a narrow claim and still be theoretically important if it states the conditions under which the mechanism is expected to operate. Conversely, broad claims require correspondingly broad evidence or a carefully justified theoretical argument.

Scale and boundary transparency creates a path for cumulative research. Later studies can test whether a mechanism persists under different institutional arrangements, whether a relation changes when the scale is expanded, or whether a boundary previously treated as external should become endogenous to the analysis. Boundary choice is therefore both a limitation and a research instrument.

3.17.3 Identification of the Generative Claim

A GRE contribution should identify its generative claim explicitly. The generative claim states what the specified relation is proposed to generate, reproduce, transform, distribute, or foreclose, through which mechanism, and over what temporal horizon. This is the criterion that most clearly distinguishes a GRE contribution from a study that merely uses relational language.

The generated object can take many forms. It may be a capability, resource, institutional position, subject identity, expectation, dependency, value form, knowledge structure, ecological condition, network topology, bargaining position, classification, infrastructure, norm, or future option. It may also be a change in the conditions under which further generation occurs. The generative claim should therefore name the analytical object rather than relying on the generic statement that a relation "creates value" or "produces effects."

The mechanism also matters. A relation may generate later capacity through learning, investment, access, network reinforcement, institutional recognition, technological complementarity, legal stabilization, reputational accumulation, ecological regeneration, coordination, or another process. It may generate foreclosure through extraction, depletion, lock-in, exclusion, deskilling, dependency, displacement, institutional erosion, or destruction of alternatives. Different mechanisms can produce similar observed outcomes, and the same mechanism can have different consequences under different conditions.

Generative claims can vary in strength. A descriptive contribution may show that a relational configuration is systematically associated with later capacity formation. A historical contribution may reconstruct a plausible mechanism across a sequence of institutional changes. A causal contribution may identify the effect of a specified relation on a downstream outcome under defined assumptions. A formal contribution may demonstrate that a mechanism can generate a class of patterns within a model. A simulation may explore the conditions under which a proposed mechanism becomes sufficient or insufficient. These claims should be distinguished rather than compressed into one category of proof.

A strong GRE contribution also clarifies whether the mechanism concerns generation within an existing structure or transformation of the structure itself. Creating additional productive capacity under stable rules differs from changing ownership, classification, institutional authority, or the effective rules by which future capacities are generated. The distinction helps prevent ordinary output expansion from being mislabeled as deep generative transformation.

The purpose of requiring an explicit generative claim is therefore diagnostic as well as disciplinary. It enables readers to ask whether the claimed generated object actually changes, whether the proposed mechanism is observed or inferred, whether alternative mechanisms fit the evidence, and whether the effect persists beyond the immediate horizon. Generativity becomes a researchable proposition rather than an honorific description.

3.17.4 Evidence Appropriate to the Claim

Evidence in GRE should be appropriate to the epistemic form and strength of the claim. No single evidential hierarchy governs every generative question. Historical reconstruction, ethnography, interviews, administrative records, experiments, quasi-experiments, surveys, network data, financial records, ecological measurements, computational traces, legal documents, formal proofs, and simulations can each support different kinds of inference. Methodological pluralism therefore requires disciplined matching between claim and evidence.

A claim about lived dependency may require qualitative or interpretive evidence that cannot be replaced by aggregate transaction data. A claim about population-level incidence may require quantitative evidence that interviews alone cannot establish. A claim about historical institutional transformation may require archival evidence and temporal reconstruction. A causal claim about an intervention may require an identification strategy capable of distinguishing the effect from confounding processes. A formal claim requires internally valid derivation under stated assumptions. A simulation establishes consequences of modeled rules and parameters rather than direct observation of the empirical target.

The evidence should also correspond to the downstream object named in the generative claim. If a paper claims that a financing relation generates capability, it should observe or defensibly proxy the relevant capability rather than infer it solely from the initial allocation of finance. If a platform intervention is claimed to increase autonomy, measures of throughput or usage alone are insufficient unless the relation between those measures and autonomy is theoretically and empirically justified. If an ecological practice is claimed to regenerate future production conditions, evidence should reach beyond current output toward the ecological capacities that support future activity.

Mixed evidence can be especially valuable when the generative mechanism crosses representational levels. Quantitative data may reveal a distributional pattern while interviews clarify how the relation operates. Institutional documents can establish formal authority while observed practice reveals its implementation. Simulation can explore whether a proposed mechanism is sufficient to produce an observed macro-pattern while empirical data constrain the plausible parameter range. Such combinations should be integrated through a stated inferential logic rather than accumulated as decorative methodological diversity.

Evidence appropriateness also includes negative evidence and failed expectations. When a proposed generative mechanism predicts downstream change that does not occur, the absence can narrow the mechanism, reveal a missing condition, or indicate that the representation is wrong. GRE should therefore retain evidential structures that permit a generative claim to be weakened or rejected. A programme that can only reinterpret every outcome as evidence of hidden generativity would cease to be empirically corrigible.

3.17.5 Distinction between Representation and Relational Reality

A GRE contribution should distinguish the representation used in analysis from the relational reality the representation is intended to illuminate. Networks, graphs, categories, state spaces, fields, equations, indicators, taxonomies, maps, legal classifications, interview codes, and computational models are analytical constructions. They can disclose important structure while also suppressing, aggregating, or transforming aspects of the target.

The distinction is particularly important because relational analysis often makes structure visually or mathematically compelling. A network diagram can make nodes and edges appear ontologically given even when node identities, tie definitions, missing relations, and temporal aggregation are products of the data-generating process.

A scalar indicator can make heterogeneous value appear commensurable. A field representation can suggest continuity where the empirical system contains discontinuities or institutionally discrete categories. A model can hold agents or rules fixed even when historical change in those objects is part of the substantive problem.

GRE does not therefore require researchers to distrust representation. Representation is unavoidable and productive. The requirement is reflexive specification. A contribution should explain what the representation makes visible, what it treats as stable, what it aggregates, what it excludes, and how those choices affect the claim. The more strongly the conclusion depends on a representational choice, the more important sensitivity to alternative representations becomes.

This criterion also applies to institutional representations. Legal categories, accounting classifications, platform metrics, credit scores, productivity measures, and administrative identities can become economically operative representations. They are not merely researcher-created descriptions. Their use can shape access, recognition, risk, resource allocation, and subject positions. A GRE study may therefore analyze a representation both as an epistemic device and as an economic mechanism.

Maintaining the distinction between representation and relational reality supports ontological suspension. Researchers can use network, field, dynamical, or computational language without claiming that the empirical economy literally possesses the complete ontology of the formalism. The analytical question is whether the representation is adequate to the local problem and generative claim. Competing representations can remain simultaneously useful when they disclose different aspects of the same economic configuration.

3.17.6 Attention to Downstream Effects

A GRE contribution should examine downstream effects far enough to evaluate the stated generative claim. This requirement does not demand infinite causal tracing. It requires the researcher to look beyond the immediate administrative output when the theoretical claim concerns later capacities, relations, values, constraints, or possibilities.

Downstream analysis begins by identifying plausible channels of propagation. A transfer to one organization may alter wages, procurement, investment, debt, market entry, local prices, or political influence. A new classification system may affect eligibility, insurance, credit, employment, or legal recognition. An AI system deployed to increase productivity may alter skill formation, supervision, bargaining power, organizational knowledge, and dependency on technical infrastructure. A conservation intervention may change ecological capacity, land access, community authority, and future livelihood options.

GRE should distinguish propagation from attribution. Observing a downstream change after an intervention does not establish that the focal relation generated it. The contribution should specify the pathway through which the effect is expected to travel and identify evidence consistent with that pathway. Where causal identification is unavailable, the claim should remain calibrated accordingly.

Downstream attention should also include distribution. The same relation can gen-

erate gains for one subject while shifting risk, depletion, dependency, or opportunity loss to another. Aggregate improvement can therefore coexist with localized generative foreclosure. A GRE contribution should identify who receives immediate outputs, who gains later capacity, who bears costs, and whose future options become more or less available when these differences are material to the research question.

Temporal depth matters as well. Some generated effects decay quickly; others accumulate or become self-reinforcing. A short evaluation horizon can misclassify a process whose main economic significance lies in later lock-in, learning, institutionalization, ecological regeneration, or erosion. Researchers should therefore justify the chosen horizon in relation to the mechanism rather than treating the observation window as analytically neutral.

The downstream criterion ultimately protects the concept of generativity from collapsing into ordinary output measurement. GRE asks what a relation leaves behind in the capacities and conditions from which later economic processes proceed. The appropriate downstream horizon is the one required to make that question empirically meaningful.

3.17.7 Attention to Alternative Generative Mechanisms

A GRE contribution should consider plausible alternative mechanisms capable of generating the observed pattern. This criterion follows directly from epistemic humility and from the fact that similar outcomes can emerge from different relational configurations. Mechanism identification becomes stronger when the researcher explains why the preferred account fits the evidence better than important alternatives.

Alternative mechanisms can operate at the same scale or at different scales. Increased productivity within a firm may result from worker learning, capital deepening, selection of more productive workers, changes in task allocation, demand expansion, or measurement artifacts. Increased community income after an intervention may reflect genuine local capability generation, temporary transfers, migration, price effects, or extraction from another location. Institutional persistence may arise from legitimacy, coordination benefits, legal coercion, network lock-in, sunk costs, or the absence of viable alternatives.

GRE should also remain attentive to equifinality: different histories can produce similar configurations. The existence of a stable relation does not uniquely reveal how it was generated. Comparative, historical, and process evidence can help distinguish pathways. In formal or computational research, sensitivity analysis can show whether the result depends on a narrow mechanism or emerges across several model structures.

Alternative mechanisms include representational alternatives. An apparent relation can arise because of measurement, classification, selection, aggregation, or omitted variables. A network pattern can change when edge definitions change. A capability indicator can move because the proxy changes while the underlying capability does not. A historical discontinuity can reflect an archival or institutional change in what was recorded. These possibilities do not invalidate the analysis; they specify additional hypotheses that should be considered where material.

The purpose of this criterion is not to require exhaustive refutation of every imaginable mechanism. It is to prevent a favored generative narrative from becoming insulated from competition. A GRE contribution should identify the most consequential alternatives given the domain, evidence, and claim strength, and state what additional evidence could discriminate among them. Competing mechanisms are part of cumulative research rather than threats to disciplinary coherence.

3.17.8 Normative Transparency

A GRE contribution should make its normative premises transparent whenever evaluative language enters the argument. Terms such as improvement, harm, empowerment, exclusion, justice, sustainability, resilience, capability, autonomy, participation, regeneration, and desirable generation carry normative content that should not be smuggled into a descriptive mechanism claim.

Normative transparency begins by distinguishing what the study observes from how it evaluates what is observed. A relation may generate new productive capacity while also increasing domination. A technology may expand access while weakening privacy or exit. A policy may preserve an institution while reducing the possibility of alternative forms of organization. A regenerative ecological intervention may improve biophysical conditions while distributing burdens inequitably. These cases cannot be evaluated solely by establishing that generation occurred.

The relevant evaluative principles should therefore be stated at the level needed for the claim. A study may adopt a capability perspective, a rights-based standard, a distributive criterion, a relational account of domination, a procedural standard, an ecological constraint, a plural-value framework, or another justified normative basis. GRE does not require one universal normative theory at the level of research contribution. It requires researchers to distinguish the empirical and generative analysis from the premises through which consequences are judged.

Normative transparency is equally important when a study refrains from full evaluation. Researchers may state that a mechanism increases a capability, concentrates control, or changes future options while leaving the overall justice of the arrangement unresolved. Such restraint can be more informative than forcing heterogeneous effects into a single welfare ranking.

Value plurality further requires explicit treatment of commensuration. If a study aggregates several forms of value into one index, score, monetary measure, or optimization objective, it should explain the justification and consequences of that aggregation. Practical commensuration may be necessary for decision-making without establishing that the underlying values are genuinely commensurable. A GRE contribution should preserve this distinction when it matters.

Normative transparency thus protects both positive and normative inquiry. It prevents descriptive evidence from carrying more evaluative force than it can support, while allowing ethical and political judgments to enter economic analysis openly rather than being hidden in model structure, metric selection, or outcome definition.

3.17.9 Reproducibility and Interpretive Traceability

A cumulative research programme requires other researchers to be able to reconstruct how a conclusion was produced. GRE therefore treats reproducibility and interpretive traceability as complementary standards. Their concrete form varies by method, but the underlying requirement is that the pathway from material or data to claim should remain inspectable.

For quantitative and computational work, reproducibility may involve accessible data where ethically and legally possible, documented preprocessing, variable definitions, code, model specifications, parameter choices, random seeds, robustness checks, and version information. Where data cannot be shared, the study should provide enough procedural detail to clarify what another researcher would need to reproduce the analysis under authorized access.

For qualitative, historical, and interpretive research, exact replication may be impossible or conceptually inappropriate. Interpretive traceability becomes the more suitable standard. The researcher should document source selection, coding or interpretive procedures, archival boundaries, translation choices, interview protocols, contextual assumptions, and the evidential basis for major interpretive moves. Readers should be able to distinguish the source material from the interpretation built upon it.

Formal research requires a related form of traceability. Definitions, assumptions, derivations, propositions, and the relation between formal objects and empirical interpretation should be explicit. A proof can be reproducible while its empirical meaning remains ambiguous; both layers therefore need documentation. Simulation requires the same separation between reproducibility of the computational experiment and validity of the modeled representation.

Traceability also applies to boundary and category revision. If a study changes the definition of a subject, relation, value form, or relevant system during analysis, the change should be visible. Such revision can be intellectually productive, especially in relational research where the empirical material may reveal that initial categories are inadequate. The contribution becomes stronger when readers can see why the revision occurred and how it affected the result.

These standards are not merely procedural ideals. They distribute epistemic authority. A claim whose evidential path can be inspected is easier to contest, reinterpret, update, and reuse. Reproducibility and interpretive traceability therefore support the broader GRE commitments to revisability, methodological pluralism, and re-epistemization across time.

3.17.10 Contribution to Cumulative Knowledge

A GRE contribution should clarify what becomes more knowable because of the study and how that result can enter a cumulative research programme. Novel terminology alone is insufficient. A contribution may refine a concept, establish a new typology, identify a mechanism, map a relational configuration, provide comparative evidence, develop a formal representation, test an intervention, construct a measure, document a boundary condition, falsify an earlier claim, or expose an unresolved contradiction.

These are different forms of cumulative advance.

Cumulative contribution requires relation to prior work. A study should indicate which GRE problem, concept, mechanism, or empirical domain it extends, revises, or challenges. Because GRE is an emerging programme, this relation may initially be internal to the book's preliminary constitution or to a small body of subsequent work. The standard should nevertheless be established early: later research should not repeatedly reinvent the same relational vocabulary without specifying what has changed.

Negative and limiting results are especially important. Demonstrating that a proposed generative mechanism fails under certain institutional conditions can advance the programme by specifying its scope. Showing that two indicators previously treated as proxies diverge can improve measurement. Identifying a case in which downstream generation is negligible can prevent overextension of the framework. Revealing that competing representations yield materially different conclusions can redirect theoretical development. Cumulative knowledge includes disciplined contraction as well as expansion.

A contribution should also preserve reusable analytical objects where possible. Clearly defined categories, documented datasets, mechanism diagrams, typologies, validated measures, formal models, intervention protocols, comparative cases, and explicit boundary conditions can support later synthesis. Reusability does not require standardization of every method. It requires enough conceptual and evidential continuity for results to be compared rather than remaining isolated narratives.

Cumulative knowledge in GRE is expected to remain historically revisable. Concepts adequate to one technological or institutional period may become insufficient as economic subjects, relations, infrastructures, and forms of value change. The purpose of accumulation is therefore not to build an immutable doctrinal core. It is to build a record of concepts, mechanisms, evidence, boundary conditions, disagreements, and revisions from which later inquiry can proceed with greater precision.

Taken together, the criteria in this section provide a practical threshold for recognizably GRE research. A contribution should specify the relation under study, state its scale and boundaries, articulate the generative claim, match evidence to the claim, distinguish representation from relational reality, trace relevant downstream effects, consider plausible alternative mechanisms, disclose normative premises, preserve reproducibility or interpretive traceability, and explain how the result contributes to cumulative knowledge. The criteria remain proportional to the type of inquiry, but they create a common language for criticism across heterogeneous methods.

These standards also shift Chapter 3 from disciplinary constitution toward research development. Once contributions can be evaluated individually, the next question concerns how they can accumulate across projects into a programme that develops concepts, typologies, maps, mechanisms, formal models, simulations, intervention evidence, measures, and revisions over time. The following section therefore turns from the criteria for a single GRE contribution to the architecture of a cumulative GRE research programme.

3.18 Cumulative Research Programme

The preceding section specified the standards by which an individual contribution can be recognized as part of Generative Relational Economics. A research programme, however, requires more than a sequence of individually competent studies. It requires mechanisms through which concepts can be stabilized and revised, cases can become comparable, mechanisms can be accumulated across contexts, formal and computational representations can become reusable, interventions can generate transferable evidence, measures can be improved, and theoretical claims can contract as well as expand. The role of this section is therefore to specify how GRE can develop cumulatively without converting cumulative development into doctrinal closure. Its objective is to identify several forms of accumulation through which a still-emerging research programme can become more precise, more testable, more comparable across domains, and more corrigible over time.

Cumulative development in GRE is expected to be heterogeneous. Historical reconstruction, conceptual clarification, comparative case analysis, mechanism identification, formal modeling, simulation, intervention research, and indicator construction do not accumulate in identical ways. A concept can become more precise without becoming more universal. A mechanism can recur across cases while remaining conditional on institutional context. A formal model can improve analytical discipline without establishing empirical adequacy. An intervention can generate evidence about a relational configuration that cannot be transferred unchanged to another scale. The programme therefore needs forms of accumulation that preserve local differences while still allowing knowledge to travel.

The central commitment is that accumulation should increase the quality of future inquiry rather than merely increase the quantity of publications. A cumulative programme should make later researchers better able to distinguish objects, specify boundaries, formulate mechanisms, compare cases, identify failed expectations, construct representations, and revise earlier claims. Accumulation is therefore closely related to memory: the programme must preserve not only successful formulations but also boundary conditions, null findings, abandoned distinctions, incompatible representations, and reasons for revision. This historical record is part of the epistemic infrastructure through which GRE can remain generative without repeatedly rediscovering its own problems.

3.18.1 Conceptual Development

Conceptual development provides one of the earliest forms of cumulative work in an emerging research programme. GRE depends on terms such as relation, generativity, capacity, subject, field, orientation, propagation, conversion, foreclosure, and generative condition. These terms can guide inquiry only when their meanings become sufficiently explicit for disagreement, comparison, and revision. Conceptual development therefore concerns the progressive clarification of what a term denotes, what it excludes, how it differs from neighboring terms, which empirical indicators can bear upon it, and under what conditions the concept ceases to be useful.

Such development should proceed through distinction rather than inflation. A

concept becomes stronger when researchers can identify nearby phenomena that it should not subsume. Generativity, for example, should not become a general synonym for causation, productivity, innovation, emergence, or social change. Relationality should not become a label attached to any situation containing more than one actor. Orientation should not become equivalent to intention. Power should not become interchangeable with every asymmetry. Conceptual accumulation therefore requires negative space: a concept is partly stabilized by the cases and mechanisms that researchers agree belong elsewhere.

Conceptual development is also historical. A distinction useful in one institutional or technological period may become insufficient when the object changes. The meaning of economic subjecthood may need revision when artificial systems undertake increasingly consequential operational roles. The concept of resource may change when informational, ecological, infrastructural, or symbolic forms become central to production. The concept of value may require further differentiation when heterogeneous value forms interact without stable conversion ratios. GRE should therefore treat conceptual stabilization as provisional achievement rather than final definition.

A cumulative conceptual record should preserve successive formulations and their reasons. Later versions should make visible whether a term was broadened, narrowed, divided, or replaced. This allows conceptual disagreement to become cumulative rather than repetitive. Researchers can then ask whether a difference arises from incompatible definitions, different empirical domains, different scales, or genuinely competing theoretical commitments. Conceptual development becomes part of research infrastructure when it reduces ambiguity while preserving the possibility of revision.

3.18.2 Typology Development

Typologies allow recurrent heterogeneity to be organized without requiring reduction to a single scalar dimension. They are especially important for GRE because many objects of inquiry are structurally plural: economic subjects can differ in kind, relations can differ in direction and persistence, value can take multiple forms, generative effects can propagate through different channels, and interventions can create benefits and harms through distinct mechanisms. A typology provides a way to preserve these differences while making comparison possible.

Typology development should begin from analytically relevant distinctions rather than from the desire to populate a classificatory table. A useful typology changes what can be observed or compared. Distinguishing resource asymmetry from capability asymmetry, for example, matters because possession and effective capacity can diverge. Distinguishing relational dependence from domination matters because dependence can exist without one subject acquiring durable control over another. Distinguishing propagation, conversion, recirculation, dissipation, and extraction matters because downstream value trajectories differ even when an initial allocation is identical.

Typologies should also remain open to overlap. GRE objects are frequently multidimensional, and a single case can instantiate several types at once. A platform may be simultaneously an organizational actor, a field-structuring infrastructure, a rep-

resentational system, and a locus of institutional power. A transfer programme can be allocative, capability-enhancing, dependency-producing, and institution-forming at different stages. Typological clarity therefore does not require exclusive membership unless exclusivity is substantively justified.

Cumulative typology development requires empirical confrontation. Categories should be revised when recurrent cases do not fit, when two categories fail to produce meaningful explanatory differences, or when one category hides internally distinct mechanisms. Cross-case work is especially important because a typology derived from one institutional context may mistake a local classification for a general one. Typologies accumulate when their boundary conditions, empirical uses, exceptions, and revisions are recorded rather than when their labels simply proliferate.

3.18.3 Relational Mapping

Relational mapping concerns the systematic representation of economically consequential connections among subjects, institutions, resources, infrastructures, representations, capacities, and environments. The purpose is not to impose a universal network ontology. It is to make relational structure visible enough that claims about mediation, dependence, propagation, power, or generation can be examined rather than assumed.

Different research problems require different maps. A transaction map may trace flows of money or goods. An authority map may represent legal and organizational powers. A capability map may identify which relations enable access to knowledge, infrastructure, care, finance, or mobility. A representation map may show how classifications and metrics connect institutional decisions to subject positions. A temporal map may represent the order through which one relation conditions a later possibility. Ecological or supply-chain analysis may require several of these layers simultaneously.

Cumulative relational mapping depends on comparability without forced standardization. Researchers should document node definitions, relation types, temporal windows, missing-data assumptions, scale choices, and the meaning of direction or weight where these are used. When mappings from different studies cannot be directly combined, the reasons should be visible. Differences in mapping conventions can then become substantive evidence about how the object itself is differently constituted across contexts.

Relational maps can also accumulate historically. Repeated mapping can show how a configuration changes, which ties persist, which dependencies become concentrated, where new intermediaries emerge, and whether an intervention alters the topology of opportunity or control. Longitudinal mapping is particularly useful for GRE because generative claims often concern changes in the conditions from which later actions become possible. The cumulative product is not a final map of the economy, but a set of documented representations that can be compared, revised, and linked to mechanism claims.

3.18.4 Mechanism Identification

Mechanism identification provides a central bridge between relational description and generative explanation. GRE is concerned not only with whether two conditions are associated, but with how a relation contributes to the production, reproduction, transformation, or foreclosure of later capacities and possibilities. A cumulative programme therefore needs recurrent mechanism families that can be investigated across settings without assuming that the same mechanism operates universally.

Mechanisms may involve resource access, learning, coordination, institutional recognition, bargaining leverage, infrastructural dependence, feedback, expectation formation, classification, imitation, exclusion, risk transfer, ecological regeneration, or many other processes. What makes such a process a useful GRE mechanism is not its novelty of name but its role in connecting a relational configuration to a downstream change. The mechanism should specify intermediate transformations sufficiently clearly that evidence can support, weaken, or reject the claim.

Cumulative mechanism work benefits from decomposition. A broad claim that an intervention ”builds capability” may contain several distinct processes: it may increase material resources, reduce uncertainty, create social recognition, provide technical knowledge, alter institutional eligibility, or change expectations about future access. Disaggregating these processes allows later studies to test whether the same downstream effect arises through different mechanisms or whether similar interventions produce different outcomes because only some mechanism components are present.

Mechanism accumulation should therefore include enabling conditions, inhibiting conditions, competing mechanisms, and failure modes. A mechanism that appears robust in one setting may depend on trust, legal enforceability, technological infrastructure, social norms, or complementary public goods. Recording these conditions turns isolated explanations into a comparative mechanism library. Such a library remains revisable and context-sensitive, but it gives later researchers a stronger starting point than an undifferentiated appeal to relational complexity.

3.18.5 Comparative Case Accumulation

Cases become cumulative when they are documented in ways that permit meaningful comparison. GRE therefore requires comparative case accumulation rather than a collection of richly described but analytically disconnected examples. The purpose of comparison is not necessarily to produce universal laws. It can identify recurring relational configurations, clarify boundary conditions, distinguish mechanisms, reveal alternative pathways, and show how similar interventions generate different outcomes under different institutional or historical conditions.

Comparison can be organized around cases, mechanisms, trajectories, scales, or interventions. Two regions may receive similar infrastructure investments yet generate different capability effects because institutional access differs. Two platforms may use similar algorithms but create different labor dependencies because ownership and exit options differ. Two ecological restoration projects may produce comparable short-term outputs while diverging in long-run regenerative capacity. A com-

parative design becomes especially informative when the axis of comparison corresponds to a plausible mechanism difference.

Cumulative case repositories should therefore preserve more than outcome variables. They should record relational boundaries, subject categories, institutional context, temporal horizon, intervention history, relevant value forms, and evidential limitations. Standardized metadata can help without forcing all cases into identical theoretical categories. The aim is to make later synthesis possible while retaining the contextual features through which generative mechanisms may differ.

Negative and anomalous cases are particularly valuable. A case in which a predicted mechanism fails can identify a missing enabling condition or expose an overgeneralized concept. A case that produces an unexpected downstream effect can reveal a propagation channel absent from the original theory. A cumulative programme should therefore preserve cases that resist prevailing formulations rather than treating them as noise to be excluded from the archive.

3.18.6 Formal Model Development

Formal models can contribute cumulative value by making assumptions, relations, and implications explicit. In GRE, formalization may represent dynamics, networks, allocation processes, bargaining relations, value conversion, capability change, field-like influence, institutional rules, or recursive transformations of generative conditions. The purpose is analytical discipline rather than formalization for its own sake.

A cumulative formal programme should preserve model lineage. Later models should indicate which assumptions are inherited, relaxed, extended, or replaced. If one model treats subject identities as fixed while another allows subject formation, the difference should be explicit. If one model uses scalar value while another represents plural value dimensions, the comparison should identify what explanatory capacity is gained and what tractability is lost. Formal accumulation then becomes a sequence of interpretable modifications rather than a disconnected set of mathematical constructions.

Model families can also help identify which conclusions depend on which assumptions. Robustness across several formal representations strengthens confidence that a result reflects a structural feature rather than an artifact of one specification. Divergence across models can be equally informative when it reveals sensitivity to boundary conditions, topology, time horizon, or behavioral assumptions. GRE should therefore treat model disagreement as a source of theoretical information rather than merely as a problem to be eliminated.

Formal development remains subject to ontological suspension. A model can establish the consequences of stated relations without proving that the empirical economy possesses the model's ontology. Cumulative formal progress therefore requires empirical interpretation and clear links to the concepts or mechanisms represented. Reusable models, documented assumptions, and transparent derivations can become infrastructure for later studies even when empirical validation remains partial.

3.18.7 Simulation and Computational Exploration

Simulation and computational exploration extend formal development when analytic solutions are unavailable, when interaction structures are heterogeneous, or when researchers want to examine the consequences of alternative rules and parameter regimes. GRE can use agent-based models, network simulations, dynamical systems, optimization procedures, synthetic populations, and other computational methods to explore how local relations may generate larger-scale patterns.

Cumulative computational work requires reproducible experimental design. Code, parameter ranges, initialization procedures, random seeds, stopping rules, and output measures should be documented where possible. More importantly, the relation between computational objects and theoretical concepts should remain explicit. A simulated agent may represent a household, firm, algorithm, institution, or abstract decision unit, but that mapping is a modeling choice rather than an ontological fact.

Computational exploration can support cumulative knowledge by identifying candidate mechanisms, sensitivity regions, threshold behavior, path dependence, or unexpected interactions. It can also help discriminate among theories by showing that some verbal mechanism claims are insufficient to generate the observed pattern under plausible assumptions. Such findings remain conditional on the model, but they can direct empirical work toward the variables and relations most likely to matter.

Simulation results should accumulate together with failed parameterizations and negative results where feasible. If a proposed mechanism produces a target pattern only under implausibly narrow conditions, that fact is theoretically relevant. Computational archives can therefore preserve the history of model development, including abandoned specifications, so that later researchers can distinguish genuine theoretical progress from repeated rediscovery of previously rejected configurations.

3.18.8 Intervention Evidence

Interventions provide a distinctive source of evidence because they modify the relational configuration under study. Policy changes, institutional reforms, experimental programmes, platform redesigns, governance mechanisms, public investments, organizational changes, and community initiatives can reveal how relations respond when constraints or enabling conditions are altered. GRE treats such evidence cautiously because intervention effects can be path-dependent, scale-specific, and entangled with adaptation.

A cumulative intervention programme should document design, implementation, context, immediate outputs, downstream effects, unintended consequences, and later structural changes. Evidence about failure is as important as evidence about success. An intervention that produces an initial benefit but creates long-term dependency contributes different knowledge from an intervention whose effects persist after external support is withdrawn. An intervention that changes institutional recognition without altering material capacity reveals a different mechanism from one that changes both.

Intervention evidence also benefits from variation in intensity, timing, sequence, and institutional setting. Comparative intervention research can identify whether an

effect depends on complementary relations, threshold conditions, or prior histories. Where randomized or quasi-experimental identification is possible, it can strengthen causal claims. Where it is not, careful process tracing, comparative design, and longitudinal evidence can still contribute to mechanism understanding if the limits of attribution are explicit.

Cumulative praxis requires preserving correction histories. Researchers should record when an intervention was modified, suspended, reversed, or repaired and why. These histories provide evidence about the adaptability of both the intervention and the governing institutions. They also help later researchers understand which apparent outcomes were produced by the initial design and which emerged through iterative revision.

3.18.9 Measure and Indicator Development

Measures and indicators allow recurrent GRE concepts to become empirically tractable, but measurement should follow conceptual clarification rather than substitute for it. Possible GRE measures may concern relational dependence, capability access, exit conditions, propagation, concentration of generative control, value conversion, institutional recognition, ecological capacity, or forms of generative foreclosure. Each indicator compresses a more complex concept and therefore requires explicit justification.

Cumulative indicator development should include validity, reliability, sensitivity, and domain restrictions. An indicator useful in one institutional setting may fail elsewhere because the same observable carries a different relational meaning. A measure of platform dependence based on revenue concentration may miss infrastructural lock-in. A measure of capability based on resource possession may ignore conversion constraints. A measure of generativity based on output growth may overlook depletion of future enabling conditions. Indicator accumulation therefore depends on comparison with alternative measures and on documented cases where the proxy fails.

Composite indices require particular caution. Combining heterogeneous value dimensions into one score can aid communication or decision-making, but the weighting rule performs substantive evaluative work. GRE should distinguish between an index created for practical coordination and a claim that the underlying values are intrinsically commensurable. Sensitivity analysis can show how rankings or conclusions change under alternative weighting schemes.

A mature cumulative programme can maintain indicator families rather than seeking one universal GRE metric. Different measures may be appropriate for different objects, scales, and purposes. The cumulative goal is not metric unification but increasing clarity about what each measure captures, what it omits, and how it relates to the generative claim being tested.

3.18.10 Theory Revision

Theory revision completes the cumulative architecture because accumulation without revision would convert GRE into a repository of additions rather than a research

programme. Concepts, typologies, mechanisms, models, indicators, and intervention assumptions should all remain revisable when evidence, comparison, formal analysis, or historical transformation shows that earlier formulations are inadequate.

Revision can take several forms. A concept can be narrowed because it was applied too broadly. A typology can be divided because one category contains distinct mechanisms. A mechanism can be reclassified as conditional rather than general. A formal model can replace a fixed parameter with an evolving relation. An indicator can be abandoned because it tracks a proxy rather than the target concept. A normative criterion can be separated from an empirical one when the two were previously conflated. Revision is cumulative when the reason for change is documented and the consequences for earlier findings are made visible.

GRE should also preserve superseded formulations. Historical traceability allows later researchers to understand why a theory changed and whether an earlier version may still be useful in a restricted domain. Erasing theoretical history would make apparent progress difficult to evaluate because researchers could not distinguish genuine correction from terminological replacement.

Theory revision may also be triggered by transformations in the object of inquiry. New technologies, institutional forms, ecological conditions, legal arrangements, or types of economic subject can make previously adequate categories insufficient. A research programme committed to historical dependence should expect some of its own concepts to age. Revisability is therefore not a weakness added to GRE from outside; it follows directly from the claim that economic relations and their generative conditions are historically transformable.

Taken together, the ten forms of accumulation described in this section define a research programme that can grow without equating growth with theoretical expansion. Conceptual clarification can narrow terms. Typologies can remove distinctions that fail empirically. Comparative cases can reveal boundary conditions. Mechanism research can reject attractive explanations. Formal and computational work can expose contradictions. Intervention evidence can show that a promising design generates harmful dependencies. Indicators can be retired. Theory can contract. Cumulative development is therefore the organized capacity to preserve, compare, test, reuse, and revise knowledge across heterogeneous forms of inquiry.

This cumulative architecture also prepares an important disciplinary problem. As GRE develops, researchers will not necessarily converge on one ontology, one preferred method, one formal representation, one account of value, or one definition of generativity. A cumulative programme therefore requires a way to distinguish productive internal plurality from conceptual fragmentation. The following section turns to internal pluralism and competing formulations, asking how divergent approaches can coexist, criticize one another, and become comparable without forcing premature theoretical unification.

3.19 Internal Pluralism and Competing Formulations

The preceding sections have progressively specified the identity, objects, scales, questions, epistemic commitments, praxis, normative interfaces, power problems, contri-

bution standards, and cumulative structure of Generative Relational Economics. A cumulative research programme, however, cannot remain open merely by permitting new topics to be added. It must also preserve the possibility that several incompatible or partially incompatible formulations of the same problem coexist long enough to be compared, criticized, revised, and sometimes rejected. The role of this section is therefore to specify the place of internal pluralism within GRE. Its objective is to distinguish productive plurality from conceptual indeterminacy: GRE can sustain multiple ontologies, methods, formalisms, evidential strategies, value representations, and accounts of generativity without treating every formulation as equally adequate or every disagreement as irreducible.

Internal pluralism follows from the programme's earlier commitments. Ontological suspension limits the authority of any single representational scheme. Methodological pluralism recognizes that different research questions warrant different modes of access. Heterogeneous subjects and values make premature commensuration hazardous. Scale-relative entityhood means that the same economic configuration can be represented differently at different analytical resolutions. The cumulative programme further requires that alternative formulations remain visible so later work can determine which distinctions travel across contexts, which mechanisms recur, and which representations fail. Pluralism is therefore not an exception to GRE's constitution. It is one of the conditions under which the programme can remain corrigible.

Pluralism nevertheless requires discipline. A research programme becomes weak if incompatible claims are retained merely because they use different vocabularies. It also becomes weak if every disagreement is redescribed as a matter of perspective before empirical or conceptual comparison has occurred. GRE should therefore distinguish plurality of representation from incompatibility of prediction, plurality of method from contradiction in evidence, plurality of value from inconsistency in stated normative commitments, and plurality of ontology from unrestricted metaphysical permissiveness. Competing formulations become productive when their objects, boundaries, assumptions, inferential claims, and failure conditions can be made sufficiently explicit for comparison.

3.19.1 Ontological Pluralism

Ontological pluralism in GRE begins from the recognition that economic inquiry can require several kinds of object-description. A firm can be represented as a legal person, an organization, a nexus of contracts, a hierarchy of authority, a network of relations, a bundle of capabilities, an institutionalized process, or a temporally persistent configuration. These descriptions do not necessarily refer to different empirical worlds. They select different features of the same or overlapping configurations for different analytical purposes.

The earlier principle of ontological suspension therefore does not prohibit ontological language. It restricts the movement from analytical usefulness to ultimate metaphysical commitment. GRE can state that a corporation is treated as an economic subject in one analysis, a relational configuration in another, and an institutional field component in a third. Each formulation must explain what distinctions it pre-

serves, what mechanisms it makes visible, and what questions it suppresses. Ontological pluralism is legitimate when alternative object-descriptions improve inquiry without being silently conflated.

This plurality becomes especially important when objects change historically. A category that functions as a relatively stable entity during one period may later require decomposition because its internal relations become explanatory. Conversely, a dense set of relations may become sufficiently stabilized that entity-level treatment is efficient and empirically adequate. GRE therefore permits movement between entity-centered and relational descriptions as the problem changes. The choice is governed by explanatory and evidential adequacy rather than by a requirement that one level possess permanent ontological priority.

Ontological pluralism does not imply that every proposed object deserves equal standing. Some entities may be administratively convenient yet analytically misleading. Some relational categories may be too broad to identify mechanisms. Some field descriptions may erase important discontinuities. Some claims of emergence may simply rename aggregation. Competing ontological formulations should therefore be assessed by the empirical distinctions they sustain, the mechanisms they clarify, the observations they organize, and the errors they make possible to detect.

A plural programme can also contain genuine ontological disagreement. Researchers may disagree about whether a particular social fact should be treated primarily as an emergent property, an institutional rule, a represented category, a distributed relation, or a relatively autonomous object. GRE need not resolve such disagreements through constitutional fiat. It should require the competing formulations to state their consequences. If two ontologies generate indistinguishable descriptions, predictions, or interpretations for the relevant problem, the dispute may remain underdetermined. If they imply different observations, interventions, or normative diagnoses, the disagreement becomes a substantive research question.

3.19.2 Methodological Pluralism

Methodological pluralism concerns the coexistence of different strategies for producing warranted claims. GRE admits historical, interpretive, qualitative, quantitative, causal, comparative, formal, computational, and intervention-oriented inquiry because its objects can be only partially accessible through any single mode. The justification for plurality is therefore epistemic rather than diplomatic. Different methods disclose different aspects of relational and generative processes.

A historical reconstruction can identify how categories, institutions, or subject positions came to exist. Ethnographic or interpretive work can reveal meanings, tacit practices, and situated understandings that are unavailable in administrative data. Quantitative analysis can estimate distributions, associations, heterogeneity, and temporal regularities at scales difficult to observe directly. Causal designs can test specific intervention or mechanism claims under stated assumptions. Formal models can expose logical consequences and structural possibilities. Computational models can explore high-dimensional, adaptive, or path-dependent systems. None of these capacities automatically contains the others.

Methodological pluralism therefore requires claim-method matching. A computa-

tional simulation cannot by itself establish that its mechanism generated an observed historical outcome. A historical narrative cannot by itself estimate the magnitude of a population-level effect. A statistically identified average treatment effect may not explain the meanings through which the treatment was received or the institutional conditions through which it propagated. An interpretive account may clarify subject formation while leaving distributional prevalence unresolved. The value of a method depends on the claim it is used to warrant.

Pluralism also permits methodological competition. Two studies can approach the same generative claim through different designs and produce conflicting evidence. Such conflict should not be resolved automatically by a fixed hierarchy of methods. The programme should examine differences in population, scale, measurement, boundary selection, intervention timing, model specification, and inferential target. Sometimes one method will expose a limitation in another. Sometimes the disagreement will reveal that the original theoretical claim was underspecified.

The strongest form of methodological pluralism is therefore cumulative correction. Methods become mutually informative when they identify each other's blind spots and help refine the target of inquiry. GRE does not require every project to use mixed methods. It requires the programme as a whole to remain open to correction from methods capable of observing dimensions that another approach leaves unresolved.

3.19.3 Formal Pluralism

Formal pluralism extends the same principle to mathematical and computational representation. GRE has inherited resources from dynamical systems, complexity theory, network science, higher-order and multilayer representations, field formalisms, information theory, computation, and simulation. These formalisms organize different kinds of structure. A dynamical system emphasizes state, trajectory, stability, and transformation through time. A network emphasizes patterned relations among identifiable nodes. A higher-order representation can make irreducibly multi-actor interactions explicit. A field representation can describe distributed conditions that vary across a domain. Agent-based or computational models can explore local rules, heterogeneity, and emergent aggregate behavior.

GRE therefore has no constitutional reason to privilege one formal language as the universal representation of economic relations. Formal choice should follow the structure of the research problem. A model of propagation through contractual dependencies may be naturally network-based. A problem concerning distributed accessibility or exposure may be represented more effectively through a field. A question about transition between regimes may require dynamical analysis. A question about heterogeneous adaptive actors may benefit from simulation. Several representations may be needed for the same empirical system.

Formal pluralism also protects the programme from a recurrent category error: mathematical elegance should not be mistaken for ontological authority. Two mathematically distinct representations can sometimes encode the same empirically relevant relation. Conversely, one formalism can fit several empirical situations whose mechanisms differ. Formal equivalence, approximation, simulation, or mapping therefore needs to be distinguished from substantive equivalence of the

represented processes.

Competing formalisms should be compared through their assumptions, representational losses, empirical accessibility, computational tractability, and consequences for inference. A more complex formalism is not necessarily better. Additional dimensions, layers, parameters, or interacting fields can increase expressiveness while reducing identifiability. A simpler model can be preferable when its omissions are explicit and its inferential target is narrow. Formal pluralism is productive when representational choice remains accountable to evidence and purpose.

3.19.4 Quantitative and Qualitative Approaches

Quantitative and qualitative approaches often differ in data structure, inferential form, sampling logic, and the kinds of uncertainty they make visible. GRE treats these differences as analytically important rather than as a division between rigorous and non-rigorous inquiry. Quantitative work can establish patterns across large populations, estimate magnitudes, compare distributions, and model temporal or relational structures. Qualitative work can reconstruct meaning, institutional practice, local causal process, category formation, tacit knowledge, and the situated experience through which economic relations become operative.

The distinction is particularly important for generative analysis. A downstream effect can be quantitatively measurable while its mechanism remains poorly understood. Conversely, an interactional mechanism can be richly documented in a small number of cases while its prevalence, distribution, or aggregate contribution remains uncertain. GRE should therefore resist converting one form of evidence into claims warranted only by the other.

Mixed designs can be valuable when the forms of evidence address complementary parts of the same generative claim. A qualitative study can help identify mechanisms, categories, or boundary conditions that later quantitative work tests across cases. Quantitative anomalies can direct qualitative inquiry toward previously invisible heterogeneity. Administrative or network data can identify patterns of propagation, while interviews or archival evidence reveal why particular pathways existed. Such integration should be designed around a shared research problem rather than around the ceremonial inclusion of multiple methods.

Qualitative and quantitative approaches can also disagree productively about the object itself. A variable that appears stable in a dataset may combine historically different institutional meanings. A locally salient category may have no reliable population-level measure. A statistically robust association may depend on classifications whose social production requires separate analysis. GRE's relational commitments make these disagreements substantive because measurement categories can participate in the relations they represent.

The programme therefore treats quantitative and qualitative approaches as mutually corrective without requiring symmetry in every project. The relevant question is which claims remain unsupported when only one form of evidence is available and whether the resulting limitation materially changes the argument.

3.19.5 Causal and Interpretive Approaches

Causal and interpretive approaches address different but frequently intersecting questions. Causal inquiry asks whether and through what mechanisms a change in one condition contributes to a change in another under specified assumptions. Interpretive inquiry asks how actors, institutions, representations, and practices acquire meaning within a situated historical and relational context. GRE requires both because economic relations can operate through mechanisms whose effectiveness depends on interpretation.

A legal classification, price signal, credential, ranking, or algorithmic recommendation can alter behavior partly because subjects recognize, contest, trust, misunderstand, or strategically use what the representation means. In such cases, interpretation is not merely commentary after causal analysis. It can be part of the causal mechanism. At the same time, the existence of meaning does not establish the magnitude or distribution of its effects. Interpretive adequacy and causal identification remain distinct epistemic achievements.

The same distinction applies to subject formation. Researchers may interpret how a worker, consumer, creditor, beneficiary, or platform participant is institutionally constituted and how that subject position is experienced. A causal study may then examine whether entering that position changes behavior, income, access, or later opportunities. The two analyses can support each other without collapsing into a single method.

Competing causal and interpretive accounts become especially useful when they disagree about where the mechanism lies. A causal model may attribute an effect to incentives, while interpretive evidence suggests that the intervention changed recognition, legitimacy, or perceived obligation. Rather than treating one vocabulary as necessarily deeper, GRE should ask what observable consequences follow from the alternative mechanism accounts and whether both processes operate at different stages or scales.

Causal and interpretive pluralism therefore requires translation without reduction. Researchers should state when an interpretive category enters a causal model, how it is observed, and what is lost in operationalization. Conversely, causal evidence can constrain interpretations by showing that a proposed meaning-making mechanism does not produce the expected distributional or temporal pattern. Productive integration occurs when each approach can expose conditions under which the other's claims fail.

3.19.6 Network and Field Representations

Network and field representations provide a concrete example of formal pluralism because they organize relational structure differently. A network begins from distinguishable nodes and relations among them. It is well suited to questions concerning adjacency, centrality, brokerage, diffusion, dependence, multilayer connectivity, and evolving topology. A field representation describes conditions distributed across a domain and can be useful when influence, accessibility, exposure, salience, or constraint varies continuously or when pairwise ties provide an incomplete description.

These representations can overlap without being interchangeable. A network of financial obligations can identify who depends directly or indirectly on whom. A field representation may instead characterize how liquidity conditions, regulatory exposure, information availability, or market accessibility vary across positions. The network makes discrete relational pathways explicit; the field can make distributed background conditions visible. A system can contain both.

Choice between network and field representation should therefore follow the mechanism. If transmission occurs through identifiable connections, a network may be the natural first representation. If subjects respond to a spatially, institutionally, or symbolically distributed condition, a field can be more informative. Some problems require hybrid representations in which nodes and edges evolve within fields that also respond to network activity.

The competing representations can generate different intuitions about intervention. Network analysis may suggest altering connections, central nodes, or dependency pathways. Field analysis may suggest changing distributed conditions that shape many interactions simultaneously. GRE should not infer that one intervention is superior from the representation alone. The empirical question is which representation captures the mechanisms through which the relevant generative effects actually propagate.

The plurality also reinforces ontological suspension. Network nodes need not be ultimate entities, and fields need not be literal physical fields. Both are representational devices whose adequacy depends on what they permit researchers to observe, explain, predict, or intervene upon.

3.19.7 Scalar and Non-Scalar Value Representations

Value presents a particularly consequential case of internal pluralism. Some economic questions require scalar representation. Prices, costs, quantities, income, expected returns, or index values can support comparison, optimization, aggregation, and accounting. Other forms of value resist stable reduction to one dimension because they involve heterogeneous goods, rights, relationships, capabilities, ecological conditions, meanings, or obligations whose trade-offs are context-dependent or normatively contested.

GRE therefore permits scalar and non-scalar representations of value. The choice must be justified by the evaluative task. A scalar representation can be useful when a common unit is institutionally established, empirically meaningful, and relevant to the question. It becomes misleading when the numerical scale hides changes in what is being valued, who has authority to define the conversion, or which losses cannot be represented adequately by the chosen unit.

Non-scalar representation can preserve plurality through vectors, partial orderings, categorical distinctions, threshold conditions, lexicographic priorities, narrative evaluation, or explicit statements of incommensurability. Such representations do not eliminate the need for decisions. Institutions frequently must act even when values cannot be reduced to a common metric. The analytical task is to distinguish practical commensuration from demonstrated commensurability and to make visible who establishes the conversion rules.

Competing value representations can lead to different judgments about the same intervention. A project may generate positive monetary returns while degrading ecological resilience, increasing dependency, or reducing future option sets. A multidimensional representation can reveal this divergence. Conversely, retaining every value dimension without prioritization can make decision procedures indeterminate. GRE therefore treats value representation as part of the problem rather than assuming that either scalarization or irreducible plurality is universally preferable.

Comparison among value representations should examine what each includes, excludes, weights, converts, and renders visible. It should also ask how the representation itself affects institutional action. An indicator that becomes a target can reorganize behavior; a price can alter the relation it measures; a ranking can generate new incentives and subject positions. Value representation is therefore both epistemic and potentially generative.

3.19.8 Competing Accounts of Generativity

Generativity is the organizing concept most likely to produce internal theoretical disagreement within GRE. The term can refer to several related but distinct phenomena: production of downstream capacities, emergence of new entities or relations, transformation of subject positions, expansion or contraction of future possibilities, creation of new value forms, alteration of institutional pathways, or modification of the effective rules through which later change occurs. These processes can coexist, but they should not be treated as interchangeable by definition.

One account of generativity may emphasize the creation of capacities. Another may focus on the reproduction and transformation of relational structures. A third may treat generativity primarily as alteration of future possibility spaces. A fourth may emphasize recursive change in the mechanisms that produce subsequent outcomes. GRE should allow these accounts to compete because their differences can clarify what exactly is claimed to be generated.

Competing accounts should state their unit of analysis, temporal horizon, baseline, mechanism, and observable consequences. A claim that a relation generates capability requires evidence different from a claim that it generates institutional persistence. A claim that an intervention expands future possibility requires a specification of whose possibilities, over what horizon, under which constraints, and relative to which counterfactual or historical baseline. A claim that a rule transforms its own conditions of reproduction requires evidence beyond ordinary downstream effects.

The programme should also permit the possibility that generativity is not a single natural kind. Different domains may contain several mechanisms that share a family resemblance but cannot be reduced to one formal definition. In that case, cumulative research should develop a typology of generative mechanisms rather than force premature unification. Conversely, if apparently different mechanisms can be shown to instantiate a common structure, theory can become more parsimonious.

Internal competition around generativity is therefore desirable when it increases discriminability. A successful formulation should make it easier to determine when a process is merely productive, causal, adaptive, or reproductive and when a stronger generative claim is warranted. The concept becomes weaker when it absorbs every

form of change and stronger when competing accounts specify different empirical commitments.

3.19.9 Productive Disagreement

A plural research programme depends on disagreement that can change what researchers subsequently do. Productive disagreement is therefore more demanding than the coexistence of opinions. It requires disagreement to be localized sufficiently that evidence, argument, or comparison can alter the standing of competing claims.

Researchers can disagree about concepts, boundaries, mechanisms, measurements, formal representations, empirical generalization, normative premises, or intervention implications. These forms of disagreement should be distinguished because they require different responses. A definitional disagreement may be resolved through conceptual clarification. A measurement disagreement requires validity evidence. A mechanism disagreement may require process tracing, experiments, comparative cases, or temporal data. A normative disagreement may persist even after empirical questions are settled because the disagreement concerns values or justificatory principles.

Productive disagreement also requires preserving losing formulations long enough to understand why they failed. If a model is rejected because its mechanism does not fit observed timing, that reason should become part of programme memory. If a concept is narrowed because it collapsed several distinct phenomena, the earlier broader usage should remain traceable. If two formulations apply at different scales, the outcome is not necessarily victory of one over the other but clarification of boundary conditions.

Disagreement becomes unproductive when formulations shift whenever evidence challenges them, when different vocabularies hide identical claims, when claims are insulated from possible counterevidence, or when normative and empirical disagreements are repeatedly confused. A plural programme therefore needs conventions for making commitments explicit enough that revision is possible.

The social organization of disagreement also matters. Dominant institutions, disciplines, languages, data infrastructures, or publication norms can determine which formulations are visible enough to be contested. GRE's own commitment to pluralism therefore includes attention to the conditions under which alternative formulations can enter the research programme. Inclusion of alternatives, however, does not suspend standards of evidence or argument. Productive pluralism widens the space of contestation while preserving the possibility of criticism.

3.19.10 Conditions for Theory Comparison

Internal pluralism becomes cumulative only when competing formulations can be compared under explicit conditions. Theory comparison in GRE should therefore begin by determining whether the formulations address the same object, scale, temporal horizon, and inferential target. Apparent disagreement can disappear once researchers recognize that one theory describes short-run adjustment while another describes long-run institutional transformation, or that one concerns individual be-

havior while another concerns field-level conditions.

Where the targets overlap, comparison should examine at least six dimensions: conceptual clarity, empirical scope, mechanism specification, evidential support, representational cost, and capacity for revision. Conceptual clarity concerns whether the theory distinguishes its principal objects and mechanisms from neighboring concepts. Empirical scope concerns the domains and boundary conditions within which the theory is expected to apply. Mechanism specification concerns what processes connect conditions to outcomes. Evidential support concerns whether available observations discriminate the theory from alternatives. Representational cost concerns the assumptions, data, computation, and abstraction required to use the formulation. Capacity for revision concerns whether failure can lead to identifiable modification rather than indefinite accommodation.

Predictive accuracy can be important but should not become the sole criterion. Some GRE problems concern historical explanation, interpretation, institutional constitution, normative evaluation, or intervention design where prediction is only one dimension of adequacy. Conversely, conceptual richness should not excuse a formulation from empirical consequences when it makes empirical claims. The criteria for comparison should therefore track the kind of contribution being evaluated.

Theories can also be compared by their generative usefulness for further research. A formulation can be valuable because it produces new measurable distinctions, suggests discriminating cases, clarifies a previously vague mechanism, or exposes a class of interventions whose consequences can be studied. Such usefulness does not establish truth, but it can justify continued investigation when direct adjudication remains incomplete.

Some competing formulations may remain partially incommensurable because they begin from different objects, values, or explanatory purposes. GRE should not manufacture a single ranking when the comparison lacks a common criterion. It should instead identify the dimensions on which comparison is possible and preserve the residual disagreement. Partial comparability is preferable to either false unification or premature declaration of complete incommensurability.

The constitutional role of internal pluralism can therefore be stated compactly. GRE should remain open to multiple formulations while requiring each formulation to expose enough of its objects, assumptions, mechanisms, evidence, values, and failure conditions to permit criticism. Pluralism protects the programme from premature closure; theory comparison protects it from indiscriminate accumulation. Together they allow disagreement to become part of cumulative inquiry.

The existence of a plural and revisable research programme also means that several difficult questions remain unresolved even after its disciplinary constitution has been specified. The following section turns from the permitted diversity of formulations to the substantive open problems that future GRE research must address.

3.20 Open Problems

The preceding sections have specified the preliminary identity, objects, scales, modes of inquiry, epistemic commitments, praxis, normative interfaces, contribu-

tion standards, cumulative structure, and internal pluralism of Generative Relational Economics. A research programme becomes more credible, however, when its unresolved problems are stated with comparable precision. The role of this section is therefore to identify several problems that remain open after the current constitution of GRE has been articulated. Its objective is neither to close those problems through definition nor to convert uncertainty into a rhetorical virtue. The aim is to distinguish questions for which GRE already has an analytical vocabulary from questions for which the mechanisms, measurements, evidential strategies, or normative criteria remain materially underdeveloped.

The open problems considered here concern identification, attribution, measurement, boundary selection, changing transformation rules, heterogeneous value, justice, symbolic reification, governance under persistent asymmetry, and long-horizon evaluation. These problems are connected, but they should not be collapsed. Better identification of a generative relation does not by itself solve downstream value attribution. A useful indicator of generativity does not establish normative desirability. A formally specified transformation rule does not guarantee that the relevant rule remains stable through the period being studied. A governance mechanism that mitigates one asymmetry can create another. The purpose of separating the problems is therefore to make future progress discriminable.

Open problems also differ in the kind of resolution they permit. Some may yield to better data, identification strategies, historical reconstruction, or formal representation. Others arise because economic relations are reflexive, boundaries are purpose-dependent, values are only partially comparable, and future possibilities cannot be observed before they are realized. GRE should therefore allow for the possibility that some uncertainty can be reduced while other uncertainty remains structural to the object of inquiry. A mature research programme needs both ambitions: to improve what can be known and to specify what remains underdetermined.

3.20.1 Identification of Generative Relations

The first open problem concerns the identification of generative relations. GRE frequently asks whether a relation contributes to the production of later capacities, institutions, subject positions, value forms, or conditions of possibility. Such claims are stronger than statements that two variables covary or that one event precedes another. They also exceed the observation that a relation participates in ordinary causal production. A relation becomes generatively relevant when its operation changes what can subsequently be produced, sustained, accessed, recognized, or transformed. The empirical difficulty lies in demonstrating that stronger claim.

Identification requires a specification of the relation, the object said to be generated, the time horizon over which generation occurs, and the mechanism that connects them. These elements can be difficult to observe simultaneously. Some relations operate through repeated interaction rather than singular events. Some produce latent capacities that become visible only when later conditions activate them. Some operate through institutional recognition or symbolic classification rather than directly observable material transfer. Some are distributed across several actors or infrastructures, making bilateral attribution misleading.

A further difficulty is that generative relations may be constitutive rather than merely productive. A worker's access to a professional network, for example, can affect opportunities while also contributing to the formation of recognized expertise, identity, or standing. A credit relation can transfer purchasing capacity while simultaneously generating dependency, reputational records, or future exclusion. In such cases the relation changes properties of the participating subjects and the environment in which later action occurs. Identification must therefore distinguish immediate output from transformation of later possibility.

Progress on this problem will require multiple forms of evidence. Longitudinal observation can reveal whether capacities persist beyond the originating relation. Comparative cases can test whether similar relational configurations produce similar downstream structures under different contexts. Process tracing can identify intermediate mechanisms. Experiments or quasi-experiments can help isolate particular pathways when intervention is possible. Formal or computational models can clarify what observations would discriminate generative mechanisms from ordinary transmission. Interpretive evidence can be necessary when generation operates through meaning, recognition, or institutional classification.

No single identification strategy is likely to cover the full range of GRE objects. The open task is therefore to develop a disciplined family of identification standards. Such standards should make it possible to distinguish a plausible generative hypothesis from a demonstrated mechanism, and a demonstrated local mechanism from a general claim about generativity across contexts.

3.20.2 Attribution of Downstream Value

A second open problem concerns attribution once value has propagated beyond an initial relation or intervention. Economic processes commonly produce effects through chains of mediation. Training can alter later employment, organizational practice, peer learning, and household security. Infrastructure can generate uses that were not anticipated by its designers. Knowledge can be recombined by actors distant from its original producer. Institutional reforms can change incentives, expectations, classifications, and later policy capacities. GRE needs ways to analyze such downstream value without converting every remote benefit into a claim of credit for the initial source.

Attribution becomes difficult because downstream effects are usually co-produced. Later value can depend on complementary resources, independent decisions, institutional environments, accumulated knowledge, ecological conditions, and subsequent interventions. A generative relation can be necessary without being sufficient. It can raise the probability of an outcome without determining it. It can create an enabling condition whose significance varies strongly across contexts. A later actor can transform an inherited resource so substantially that simple origin-based attribution becomes conceptually misleading.

The problem therefore has at least three dimensions. Causal attribution asks whether the earlier relation materially contributed to the later outcome. generative attribution asks whether it altered the conditions from which later value could emerge. Distributive attribution asks how recognition, return, responsibility, or

claims on value should be allocated among contributors. These dimensions should remain distinct because evidence for causal contribution does not settle the distributive question, and normative entitlement cannot be inferred directly from causal ancestry.

Future GRE work requires methods for tracing contribution without assuming additive decomposition. In some domains, contribution analysis may be approximately scalar. In others, interaction effects, complementarities, threshold behavior, or non-substitutable roles make scalar shares unstable or arbitrary. Network and process representations may help locate pathways without requiring a single attribution percentage. Counterfactual analysis can identify whether a contribution changed the set of feasible trajectories. Historical reconstruction can reveal how later actors transformed inherited conditions.

The objective should therefore be calibrated attribution. GRE should become better at saying that an upstream relation enabled, constrained, amplified, redirected, or conditioned later value while preserving uncertainty about the exact share attributable to that relation. Such calibrated language is important both for explanation and for later questions of return, compensation, responsibility, and justice.

3.20.3 Measurement of Generativity

The measurement of generativity presents a related but distinct problem. The concept is attractive because it directs attention toward effects on later productive and transformative possibilities. Yet the concept can become analytically weak if every beneficial downstream effect is redescribed as generativity. Measurement therefore requires a more discriminating account of what is being measured and at which scale.

Several candidate dimensions are possible. One study may measure new capabilities acquired by participants. Another may measure the diversity of subsequent activities enabled by an intervention. A third may examine persistence of effects after direct support ends. A fourth may study whether new actors can enter a domain, whether dependence on a central provider declines, or whether local reproduction becomes possible. A fifth may examine changes in the range of feasible future states. These measures capture different aspects of generativity and should not automatically be aggregated.

The temporal horizon also changes the result. An intervention can generate high short-run activity while degrading future ecological or institutional capacity. Another can impose substantial near-term cost while creating durable infrastructure or knowledge. A third can generate options that remain unused for years. Measurement therefore requires explicit time horizons and, where possible, sensitivity to delayed activation and depreciation.

Baseline selection is equally important. Generativity can be expressed relative to a prior state, a plausible counterfactual, an alternative intervention, or a historically available possibility set. These baselines answer different questions. A project can be generative relative to local past conditions while remaining less generative than another feasible arrangement. A technology can expand one actor's possibilities while narrowing those of another. A scalar score that suppresses these distinctions can obscure more than it reveals.

GRE should therefore resist the premature construction of a universal generativity index. The more promising direction is a family of measures tied to explicit objects: capability generation, institutional reproduction, option expansion, relational diversification, knowledge recombination, ecological regeneration, or transformation of future constraints. Some domains may support quantitative indicators; others may require ordinal, categorical, historical, or qualitative evidence.

The open problem is to determine when these heterogeneous measures can be compared and when they should remain separate. Measurement should increase discriminability while preserving the multidimensional character of generation. A measure becomes useful when it makes a claim more testable or comparable, not merely when it assigns a number to a concept.

3.20.4 Relational Boundary Selection

Every relational analysis requires a boundary, yet the boundary can materially determine the result. A firm can be analyzed through internal employment relations, supply chains, financial dependencies, legal institutions, ecological inputs, community effects, or global infrastructures. A household can be treated as a unit or decomposed into members with different resources, vulnerabilities, and bargaining positions. A platform can be bounded by formal ownership or expanded to include complementors, users, data providers, moderators, advertisers, and regulatory institutions. Each choice creates a different relational object.

Boundary selection is therefore more than a technical preprocessing decision. It affects which mechanisms are visible, which costs are externalized, which subjects count as participants, and which downstream effects are attributed to the focal process. A narrow boundary can produce apparent efficiency by excluding displaced burdens. An excessively broad boundary can make explanation indeterminate by treating nearly everything as part of the system.

GRE currently has principles that help discipline boundary choice: explicit scale selection, ontological suspension, claim-relative objecthood, and attention to downstream effects. These principles do not yet provide a general procedure for deciding how far a relational analysis should extend. The appropriate boundary depends on the claim. A study of contractual propagation may require one boundary; a study of ecological regeneration may require another; a study of institutional recognition may require several overlapping boundaries.

One direction for future work is sensitivity analysis across relational boundaries. Researchers can ask whether the principal inference changes when adjacent actors, longer time horizons, or additional infrastructures are included. Another direction is boundary justification through mechanism: include relations that participate materially in the mechanism under investigation and distinguish them from contextual conditions whose role is secondary. A third is normative boundary review, especially where exclusion from the analytical boundary also removes affected populations from evaluation.

The deeper problem is that boundaries can themselves be generated and contested. Legal categories, accounting rules, administrative jurisdictions, platform architectures, and disciplinary conventions determine what appears internal or external.

GRE therefore needs methods for studying boundary formation while still selecting workable boundaries for empirical research. This is an inherently reflexive task: the researcher must construct a boundary without mistaking that construction for a natural edge of the economic world.

3.20.5 Dynamics of Changing Transformation Rules

GRE places particular emphasis on situations in which the effective mechanisms of change are themselves transformed. This possibility is analytically important because many models assume that states change under a rule that remains sufficiently stable for the period of analysis. Economic history repeatedly presents harder cases: technologies alter feasible production processes, institutions modify incentives and classifications, learning changes decision procedures, political settlements alter property and authority, and adaptive systems modify the relations through which later adaptation occurs.

The open problem is empirical representation of these changing transformation rules. It is relatively straightforward to estimate changing states under a fixed model. It is harder to determine whether parameter drift is sufficient, whether the structure of interaction has changed, whether new variables have become relevant, or whether the model class itself must be revised. A sudden forecasting failure can indicate structural transformation, measurement change, omitted context, or ordinary stochastic variation. The observation alone does not identify rule change.

Different forms of rule transformation should therefore be distinguished. Parameters can change while the functional structure remains stable. Network topology can evolve while node types remain fixed. Agents can learn and alter local decision rules. Institutions can redefine available actions or recognized categories. New technologies can introduce previously unavailable operations. Symbolic changes can alter how subjects interpret the same formal option. More radical transformation can make earlier state variables inadequate because the kinds of economically relevant entities have changed.

Future GRE work requires diagnostics for these levels. Change-point methods, time-varying parameter models, adaptive networks, institutional process tracing, computational learning models, and historical comparison can each contribute. None should be treated as a universal representation. The important question is what evidence warrants movement from a claim of state change to a claim of structural change, and from structural change to transformation of the effective rule of change.

This problem also concerns anticipation. If governance relies on models whose rules can change in response to the intervention itself, policy evaluation becomes recursively difficult. Agents can adapt to incentives, classifications, metrics, and regulatory thresholds. Institutions can learn from being measured. Artificial systems can modify decision environments at high speed. GRE therefore needs forms of intervention design that monitor the stability of the assumed transformation rule rather than merely updating parameter estimates within it.

3.20.6 Heterogeneous Value Comparison

GRE's commitment to heterogeneous value creates an unresolved problem of comparison. Economic decisions frequently require choices among outcomes expressed through different value languages: income, time, health, dignity, ecological integrity, autonomy, knowledge, cultural continuity, security, care, or future option value. Practical governance cannot always defer choice until a complete theory of commensurability is available. Yet forcing these values into a single metric can erase the distinctions that motivated plural evaluation in the first place.

The problem is therefore to determine which forms of comparison are legitimate under partial commensurability. Some values may be monetizable for a specific administrative purpose while retaining dimensions not captured by price. Some can be ordered ordinally without meaningful cardinal distances. Some can be compared only within a domain. Some are subject to thresholds or rights that constrain trade-offs. Some are held by different subjects whose evaluative frameworks do not share a common scale.

GRE needs a vocabulary for these cases because generative effects often cross value domains. A policy can increase income while reducing ecological resilience. A technology can increase productivity while weakening autonomy or interpretive control. An institution can expand access for one population while eroding cultural continuity for another. The analytical challenge is to preserve these transformations without treating every trade-off as either fully aggregable or completely incomparable.

Several approaches are available for future development: vector-valued representation, partial ordering, threshold constraints, lexicographic priorities, multi-criteria analysis, deliberative comparison, qualitative matrices, and domain-specific indicators. Each imposes assumptions. The important task is to state those assumptions and to distinguish practical decision procedures from claims about underlying value equivalence.

Comparison also has a political dimension. Institutions that control the conversion interface between value forms can determine which values become legible enough to enter allocation decisions. Measurement systems, accounting rules, markets, legal standards, and algorithmic ranking can all privilege particular value representations. GRE should therefore study value comparison both as an analytical problem and as an object of economic power.

The open problem is not to eliminate heterogeneity. It is to make decision-relevant comparison possible while preserving residual differences that remain normatively or empirically meaningful.

3.20.7 Generativity and Justice

Generativity and justice intersect without being identical. An arrangement can generate substantial new capacity while distributing access, control, risk, or return unjustly. A restrictive intervention can reduce some forms of generation while protecting vulnerable subjects or preserving future ecological conditions. A relation can be locally reciprocal while depending on historical structures that shape who possesses the capacity to participate. GRE therefore needs a more developed account of how

generative analysis and theories of justice constrain, inform, and revise one another.

One unresolved issue concerns the object of justice. Evaluation can focus on resources, capabilities, recognition, participation, relations, procedures, generated opportunities, or future conditions of generation. These objects can point in different directions. Equal resource distribution can coexist with unequal conversion capacities. Broad participation can coexist with domination inside the participatory process. Expansion of future possibilities for one group can depend on ecological or social foreclosure for another.

A second issue concerns temporal distribution. Generative interventions often move value across time. Present actors can bear costs that create future capacities, while future actors can inherit both benefits and constraints without having participated in the original decision. Justice therefore requires attention to who pays for generation, who controls the generated capacity, who receives later return, and who inherits the risks of failure or lock-in.

A third issue concerns agency and authorship. When value is co-produced through distributed relations, justice cannot rely only on a simple producer-recipient distinction. Contributors can include maintainers, caregivers, communities, infrastructures, knowledge traditions, ecosystems, and future institutions. Attribution uncertainty makes distributive claims more difficult but does not remove the normative problem.

GREthic provides a neighboring domain for deeper normative theory, while GRE retains responsibility for describing the economic relations through which capacities, dependencies, returns, and foreclosures are produced. The open problem is to build interfaces between these domains without allowing normative vocabulary to substitute for economic mechanism or economic description to settle normative judgment automatically.

Progress will likely require multiple justice criteria rather than a single principle centered on generativity. Generativity can become one object of justice—especially where institutions systematically capture others' capacity to generate—but justice also constrains which forms of generation are permissible and how risks, participation, recognition, and future possibilities should be distributed.

3.20.8 Symbolic Reification

GRE relies heavily on analytical concepts such as relation, field, subject, capability, generativity, value, constraint, and possibility. These concepts are necessary for inquiry, yet repeated use can create symbolic reification: a representation introduced to organize observation begins to be treated as if it were the stable object itself. This problem is especially significant for a programme that explicitly distinguishes relations from their representations.

Reification can occur through ordinary scholarly language. A network diagram can encourage researchers to treat nodes as naturally bounded entities even when the nodes are administrative constructions. A capability measure can become identified with capability itself. A field representation can be spoken of as if the measured scalar were literally the distributed social condition. A generativity score can transform a multidimensional hypothesis into an apparently objective property. Institu-

tional categories can become research variables and then return to practice with the authority of scientific classification.

The danger increases when representations become operational. Metrics influence funding, rankings, eligibility, regulation, and organizational behavior. Models can therefore participate in generating the reality they purport to describe. Subjects adapt to categories, optimize against indicators, and reorganize behavior around algorithmic classifications. A representation can acquire causal power through institutional uptake without becoming ontologically complete.

GRE needs practices that keep this reflexive relation visible. Researchers can document category construction, preserve alternative representations, test sensitivity to operational definitions, distinguish latent constructs from measured proxies, and monitor how measures alter behavior after institutional adoption. Historical work can show how categories change. Interpretive inquiry can reveal meanings lost in standardized representation. Formal work can state which properties are assumed rather than observed.

The open problem extends beyond avoiding conceptual error. Symbolic reification can become a mechanism of power when institutions control the categories through which subjects are recognized, evaluated, funded, or excluded. The study of representations therefore belongs within the economic analysis of generative conditions. GRE must remain capable of using symbols and models decisively while keeping open the possibility that its own categories become objects of later revision.

3.20.9 Governance under Persistent Asymmetry

Section 81 treated asymmetry as a durable feature of many economic relations and distinguished it from power. The open governance problem begins where complete equalization is unavailable, undesirable, or itself generative of new dependencies. Differences in expertise, capital, institutional authority, computational capability, ecological exposure, time horizon, or exit capacity can persist even under well-designed institutions. Governance must therefore operate in conditions where symmetry cannot be treated as the endpoint.

One challenge is preventing asymmetry from becoming unreviewable domination. Transparency, contestability, exit, representation, auditing, countervailing institutions, liability, redistribution, and public infrastructure can each constrain conversion of asymmetry into power. Their effectiveness depends on context. Transparency is weak where subjects lack capacity to interpret information. Exit is weak where alternatives are costly or unavailable. Counter-power can create another concentration. Redistribution can reduce resource asymmetry while leaving institutional or epistemic asymmetry intact.

A second challenge concerns dynamic asymmetry. Capabilities change at different speeds. Artificial systems, financial institutions, states, and large platforms can update or coordinate more rapidly than individuals or local communities. Governance mechanisms designed for a slower environment can become ineffective before formal rules change. Persistent asymmetry is therefore partly temporal: the ability to learn, respond, litigate, coordinate, or revise can itself be unequally distributed.

A third challenge concerns productive asymmetry. Some differentiation enables specialization, expertise, delegation, and coordination. Governance that attempts to eliminate every asymmetry can destroy useful capacities or impose high administrative cost. GRE therefore requires criteria for distinguishing asymmetries that are functionally productive from asymmetries that generate dependency, exclusion, capture, or foreclosure. The distinction is empirical and normative rather than definitional.

Future work should compare governance architectures by how they affect conversion mechanisms. Which institutions prevent expertise from becoming unaccountable authority? Which infrastructures reduce dependence without eliminating specialization? Which rights preserve contestability when exit is impossible? Which forms of public or cooperative capacity alter bargaining structure? Which monitoring systems remain revisable when the powerful actors being monitored can adapt strategically?

The open problem is governance that remains effective under durable difference. GRE should study how relations can remain productive and heterogeneous while limiting the recursive accumulation of asymmetry into structures that remove others' capacity to participate, contest, exit, or generate alternatives.

3.20.10 Long-Horizon and Intergenerational Evaluation

The final open problem concerns effects that extend beyond ordinary observational and political horizons. Generative analysis often directs attention toward future capacities, institutional trajectories, ecological conditions, knowledge infrastructures, and path-dependent constraints. These objects can persist for decades or generations. Evaluation therefore faces a fundamental difficulty: the most important consequences may occur after the period in which evidence can be directly collected or the relevant decision-makers remain accountable.

Long-horizon evaluation raises familiar forecasting problems and additional generative-relational problems. Future subjects may possess different preferences, technologies, institutions, vulnerabilities, and value languages. Interventions can change the categories through which later outcomes are evaluated. The relevant counterfactual can also evolve. A policy that appears option-expanding under present technology can become restrictive under a later technological regime, while an apparently conservative intervention can preserve ecological or institutional capacities whose future uses are presently unknown.

Discounting provides one way to compare temporally separated effects, but discount rates encode substantive assumptions and cannot resolve all intergenerational questions. Some future losses concern irreversible ecological damage, destroyed knowledge, institutional lock-in, or loss of option-generating capacity. These may be poorly represented as ordinary delayed consumption effects. GRE therefore needs temporal representations that distinguish delayed value from changes in the capacity to generate future value.

Uncertainty compounds the problem. Forecast distributions may widen with horizon; structural transformation can invalidate the model generating those distributions; unknown future innovations can alter feasible trajectories; and future actors

cannot participate directly in present deliberation. Evaluation must therefore combine prediction with robustness, precaution, reversibility, preservation of options, and explicit treatment of model uncertainty. Different domains will justify different combinations.

Intergenerational analysis also requires attention to inheritance. Future subjects inherit infrastructure, institutions, debts, ecological conditions, knowledge, classifications, and unresolved conflicts. These inheritances shape both their opportunities and the costs of changing course. A generative intervention should therefore be evaluated partly by what kinds of revision it leaves possible for those who come later.

This problem may retain irreducible uncertainty. Future possibility spaces cannot be observed in full, and the values through which future actors judge inherited conditions cannot be completely known. GRE should not treat this uncertainty as a reason to ignore long horizons. It should instead make the uncertainty explicit and examine which interventions preserve enough diversity, reversibility, capacity, and institutional corrigibility to support later adaptation and re-evaluation.

The ten problems in this section define a research frontier rather than a list of defects awaiting simple repair. Some require better measurement and identification; some require new formal or empirical methods; some concern interfaces with normative theory; and some arise from reflexivity, historical change, and the openness of future possibility. Progress in one area can also alter another. Better generativity measures can intensify symbolic reification if their institutional use is poorly governed. Broader relational boundaries can improve downstream attribution while increasing uncertainty. Stronger governance of asymmetry can change the mechanisms whose effects were initially being measured.

GRE should therefore preserve open problems as active components of its cumulative research programme. An unresolved question becomes productive when competing formulations, evidence, failed approaches, and revisions remain traceable. The next section turns from these substantive open problems to the architecture through which the wider GRE programme can organize their investigation across epistemology, methodology, praxis, formalization, governance, knowledge, artificial intelligence, and domain-specific applications.

3.21 Architecture of the GRE Research Programme

The preceding sections have specified the provisional identity, problem-space, objects, scales, modes of inquiry, epistemic commitments, praxis, normative interfaces, contribution criteria, internal pluralism, and open problems of Generative Relational Economics. The role of the present section is different. It organizes those commitments into a research architecture that can support the remainder of the book and, more importantly, a cumulative programme extending beyond this book. Its objective is to identify the principal domains of work that GRE requires, clarify their relations, and show how movement among them can remain coordinated without collapsing them into one method, one ontology, or one normative theory. The architecture is therefore neither a linear sequence nor a departmental division of labor. It is a set of connected research components whose outputs can constrain, revise, or redirect

one another.

The programme can be understood as having several recurrent movements. Epistemological work asks what kinds of relational and generative claims can be warranted. Methodological work develops procedures for observing, reconstructing, comparing, and testing those claims. Praxis links explanation to intervention under incomplete knowledge. Substantive economic work specifies economic objects, allocation processes, value trajectories, temporal organization, power, knowledge, artificial intelligence, and domain-specific mechanisms. Formal work provides representations that can clarify structure or generate implications without acquiring automatic ontological priority. Normative and governance work evaluates how generated capacities, dependencies, harms, and possibilities should be judged and governed. None of these components is sufficient by itself. Their interaction is what gives GRE the possibility of becoming a research programme rather than a vocabulary.

This architecture also gives the later chapters a disciplined relation to Chapter 3. The chapters that follow do not merely expand terms introduced here. They test whether the constitutional claims made in Part I can survive more demanding epistemic, methodological, formal, substantive, and applied development. A concept that proves unusable under empirical inquiry should be revised. A formal representation that cannot preserve relevant historical or interpretive distinctions should be limited. A normative framework that obscures economic mechanisms should not replace explanation. An intervention methodology that generates unanticipated dependency should feed back into the theory of power and praxis. The architecture is therefore recursive: later work is expected to modify the preliminary constitution from which it begins.

3.21.1 Epistemology of Relations

A GRE research programme requires an epistemology capable of supporting claims about relations without assuming that relations are directly given to observation. Economic inquiry usually encounters traces: transactions, documents, prices, classifications, narratives, institutional records, behavioral responses, network data, legal categories, measurements, and model outputs. From such traces, researchers infer relations of dependence, recognition, exchange, authority, mediation, constraint, influence, and generation. The first architectural component therefore concerns the conditions under which these inferences are warranted.

The epistemology of relations must keep at least four layers distinguishable. There is the relation or relational process posited as part of the target situation; there are the observations through which researchers gain partial access to it; there are the categories and representations used to organize those observations; and there are the claims made on the basis of those representations. Confusion among these layers produces many characteristic errors. A network edge can be mistaken for the relation itself. A legal category can be treated as a complete description of social participation. A repeated correlation can be interpreted as a stable generative relation even where the mechanism changes historically. GRE therefore requires explicit accounts of how observations become relational claims.

This epistemic component also has to accommodate different kinds of relational ev-

idence. Some relations are materially instantiated through contracts, infrastructures, ownership, payment, or legal authority. Others are reconstructed from repeated interaction, dependence, interpretation, or institutional practice. Still others concern counterfactual or generative effects that cannot be observed directly because they refer to capacities, alternatives, or future conditions. Evidence sufficient for one kind of relation may be inadequate for another. The programme should therefore resist a single criterion of relational observability.

Epistemology of relations also includes reflexivity. Economic categories can alter the relations they represent. Credit scores change access to credit; rankings alter institutional behavior; classifications determine eligibility; models influence expectations; and public descriptions can reshape coordination. The object of knowledge can therefore respond to the means of knowing. This makes epistemology an economic problem as well as a philosophical one. The programme must study how knowledge practices participate in the relational field whose properties they attempt to establish.

The output of this component is not a final theory of knowledge. It is a set of standards for relational claims: how objects are identified, how boundaries are selected, how observations are linked to relations, how representations are validated, how uncertainty is expressed, and how claims remain open to correction. Those standards provide the epistemic ground on which the methodological components of the programme operate.

3.21.2 Methodology of Relational Inquiry

Relational methodology concerns procedures for studying configurations in which the properties or effects of an object depend materially on its relations with other objects, institutions, environments, or representations. Its central task is to move analysis beyond isolated-unit description without treating every connection as equally significant. A relational study must identify which relations matter, how they are evidenced, what scale they operate at, and which consequences follow from their organization.

The methodological repertoire is necessarily plural. Historical reconstruction can identify how a relation formed and changed. Comparative inquiry can examine why similar entities occupy different relational positions. Network analysis can represent patterned connectivity. Institutional analysis can identify rules that stabilize or authorize relations. Ethnographic and interpretive work can reconstruct how participants understand obligations, identities, and meanings. Econometric and causal designs can estimate effects generated through specified relational exposures. Qualitative process tracing can examine mechanisms that are difficult to reduce to stable variables. None of these methods is intrinsically more relational merely because of its technique. Relationality enters through the structure of the research question and the specification of the object.

A developed relational methodology should make boundary construction explicit. Researchers need criteria for deciding which actors, institutions, ecological conditions, infrastructures, classifications, and temporal histories belong inside the analysis. Because boundaries are analytical choices with substantive consequences, sensitivity to alternative boundaries should become part of methodological practice where

feasible. The same transaction can look efficient within a firm boundary and extractive within a regional labor system; a technological intervention can look productive over one year and capability-destroying over a decade.

Relational inquiry also needs procedures for distinguishing direct from mediated effects. Economic outcomes often travel through chains of institutions, expectations, infrastructures, and social recognition. A transfer to one subject can alter bargaining conditions for another; a platform rule can change incentives through ranking systems; a legal reform can transform behavior through expectations before enforcement occurs. Methodological work must therefore support the reconstruction of mediation rather than stopping at the administrative point of intervention.

The programme should accumulate relational methods through reusable design patterns rather than prescribe one canonical protocol. Useful patterns may concern boundary selection, multi-source evidence, relation typing, temporal reconstruction, counterfactual comparison, cross-scale mapping, or identification of institutional mediation. These patterns become a methodological library that later studies can adapt while preserving transparent assumptions and limits.

3.21.3 Methodology of Generative Relational Inquiry

Generative relational inquiry adds a further question to relational analysis: what later capacities, structures, values, subjects, constraints, or possibilities are produced through a relation, and through what mechanism? This shift changes both the temporal horizon and the object of explanation. The researcher is no longer concerned only with what a relation currently connects or distributes. The inquiry follows how participation in the relation changes the conditions from which subsequent economic processes can occur.

This methodological component therefore requires explicit generative claims. A study should state what is alleged to be generated, over what period, for which subjects or systems, and through which mediating process. Generation may concern skills, trust, dependency, infrastructure, market access, organizational capacity, knowledge, subject positions, ecological resilience, future options, institutional lock-in, or the capacity to generate further value. These are heterogeneous objects, so no single metric can stand in for generativity across domains.

Generative inquiry also requires attention to counterfactual trajectories. The relevant comparison is frequently not simply between treated and untreated units at one time. It may concern how different relational configurations alter later pathways. This creates methodological difficulty because the treatment can change the variables, categories, or institutional environment through which later outcomes are measured. Longitudinal designs, historical comparison, mechanism-based simulation, qualitative reconstruction, and adaptive experimentation may therefore complement conventional causal identification.

A further methodological problem concerns recursion. Generated capacities can alter the relation that generated them. New knowledge changes bargaining power; institutional learning changes governance; accumulated infrastructure shifts future allocation; successful coordination changes expectations; artificial systems can alter the speed and scale of subsequent production. Generative relational methodology

must be capable of tracing such feedback without assuming that the original mechanism remains fixed.

The programme should therefore develop a family of generative research designs rather than one universal method. Their common requirement is disciplined movement from relation to mechanism to generated consequence to altered future condition. Where the chain cannot be established, the study should say so. Where several mechanisms remain plausible, competing explanations should remain visible. This methodological restraint protects generativity from becoming an all-purpose label for any downstream change.

3.21.4 Praxis and Intervention

Praxis connects GRE's explanatory programme to purposive attempts to alter economic relations. The architectural function of praxis is to prevent theory from ending at diagnosis while also preventing intervention from outrunning knowledge. GRE therefore treats intervention as an iterative research and governance process in which action generates new evidence, changes the relational field, and may require revision of both the intervention and the theory that justified it.

A GRE praxis architecture begins with relational and generative diagnosis. The analyst identifies the relevant subjects, institutions, dependencies, constraints, capacities, value trajectories, and asymmetries. Intervention design then specifies which relation or enabling condition is to be changed, what effects are expected, which subjects may bear risks, and what indicators or qualitative observations can reveal downstream consequences. Implementation becomes part of inquiry because it tests assumptions under conditions that may differ from those represented in the initial model.

Adaptive feedback is therefore central. Interventions should include monitoring capable of detecting effects beyond the intended recipient, changes in dependency, emergent exclusion, shifts in power, unexpected conversions of value, and damage to future options. Revision can concern intensity, targeting, institutional design, representation, or even the original diagnosis. Where harm or failure becomes sufficiently probable, withdrawal, reversal, and repair need to remain available.

Praxis also requires institutional design for learning. Organizations often collect data for accountability but not for theoretical correction. GRE would instead treat intervention records, failed mechanisms, participant interpretations, unexpected effects, and reversal attempts as cumulative research materials. This creates a bridge between application-dominant work and research-dominant work. Interventions become sites in which the adequacy of relational and generative hypotheses can be examined.

The praxis component does not imply that every GRE project must intervene. It specifies the architecture required when explanation is translated into action. Its standards are proportional to stakes and uncertainty. The more irreversible, asymmetric, or long-horizon the intervention, the stronger the need for monitoring, contestability, staged implementation, reversibility, and repair capacity.

3.21.5 Economic Objects and Relational Architecture

Substantive GRE begins by reconstructing the architecture of economic objects. Firms, households, platforms, markets, contracts, currencies, technologies, infrastructures, public agencies, communities, and ecological systems can all function as economic objects, but their economic significance depends on relations that constitute access, authority, dependence, recognition, exchange, coordination, and reproduction. The programme therefore needs systematic accounts of how economic objects are stabilized and connected.

Relational architecture concerns more than mapping connections. It asks which relations are constitutive, which are enabling, which are extractive, which are substitutable, and which create dependence or future capacity. It also examines how objects change when their relational architecture changes. A firm can retain a legal identity while its productive relations, knowledge base, ownership, labor dependence, and technological infrastructure transform substantially. An apparently stable object can therefore contain changing generative conditions.

This component also organizes scale. Economic architecture can be reconstructed within organizations, across supply chains, among institutions, between human and artificial subjects, or across economic and ecological systems. At one scale a platform is an entity; at another it is a field of relations among users, advertisers, workers, algorithms, legal authorities, and infrastructures. GRE should be able to move between these representations without presuming that one scale is ontologically final.

A mature programme would accumulate relational architectures comparatively. Which configurations support distributed capability? Which concentrate dependency? Which are resilient to shocks? Which permit exit and revision? Which externalize ecological or social costs? Which generate durable learning? Comparative architectural work can provide intermediate theory between highly local case description and universal claims about markets or institutions.

This substantive component prepares several later programme domains. Allocation changes relational architecture; value moves through it; generative spacetime records its historical and temporal organization; formal models represent selected features of it; governance attempts to alter its asymmetries. Economic architecture therefore functions as a central integrative object without becoming the sole object of GRE.

3.21.6 Relational Allocation

Allocation is conventionally concerned with who receives which resources under specified constraints. GRE retains that question but expands the analytical unit. An allocation also enters a relational configuration and can change bargaining positions, dependencies, recognition, coordination capacity, expectations, and future productive possibilities. Relational allocation is the programme component that studies these mediated effects systematically.

The relevant object is therefore not merely the resource transferred. It includes the route, institutional conditions, attached obligations, timing, visibility, substitutability, and relations through which the allocation is received and used. The same mone-

tary amount can produce different consequences depending on whether it arrives as wage, grant, debt, benefit, prize, investment, family transfer, or platform payment. The relational form can influence autonomy, stigma, risk, reciprocity, and future access even when nominal quantity is identical.

Relational allocation also widens incidence analysis. Effects can propagate beyond the administrative recipient through households, markets, organizations, networks, and institutions. A subsidy can change prices, a training programme can alter labor-market competition, a public infrastructure investment can change land values, and access to computation can reshape research capacity. GRE therefore asks which relations mediate the allocation and how those relations redistribute later opportunities or constraints.

The programme should develop both descriptive and intervention-oriented allocation research. Descriptive work can reconstruct relational incidence and downstream transformation. Formal work can model how allocation changes network positions or dynamic constraints. Comparative work can examine alternative institutional forms for delivering similar resources. Normative work can evaluate whether an allocation expands capability while generating dependency elsewhere. Application-dominant praxis can use these findings to redesign allocation mechanisms.

Relational allocation is thus a bridge between conventional economic analysis and the generative programme. It retains scarcity, incentives, incidence, and trade-offs while extending attention to how allocation changes the relational conditions under which later value and capability are generated.

3.21.7 Generative Value

Generative value concerns value that arises through the capacity of a relation, resource, institution, or process to enable further valuable activity. The concept does not replace exchange value, use value, welfare, capability, social value, ecological value, or other established categories. Its programme function is to make the production of future value-generating capacity an explicit economic object.

Generative value may appear through learning, infrastructure, trust, institutional competence, scientific knowledge, ecological restoration, network access, organizational routines, or the creation of new possibilities for participation. Its effects can be delayed, distributed, and difficult to attribute to one original intervention. The same process can generate several forms of value while also producing harm, dependence, or exclusion. The programme therefore requires plural representations rather than assuming that generative value is one scalar quantity.

Research in this component should address propagation and conversion. Value generated in one domain can move into another: knowledge can become productive capability, social recognition can become market access, infrastructure can become bargaining power, ecological conditions can enable future production, and data can become organizational advantage. Conversion can also be blocked or asymmetrical. Subjects may contribute to a generative process without capturing the value that later emerges from it.

This creates questions of return and distribution. Who receives the benefits of generated capacity? Which relations permit value to recirculate to those who sustained its emergence? Which institutional arrangements enable extraction by actors positioned downstream? How should delayed or diffuse contributions be recognized? These questions connect generative value to political economy and justice without making one normative rule part of the definition of value itself.

A cumulative research programme should develop typologies of generative mechanisms, methods for tracing value trajectories, domain-specific indicators, and comparative institutional studies. It should also preserve cases in which apparently generative investments fail to create durable capacity or create capacity that later becomes harmful. Generative value becomes analytically useful only if it remains distinguishable from the general fact that economic processes have consequences.

3.21.8 Generative Spacetime

Generative spacetime provides the programme's architecture for analyzing how economic relations are organized across heterogeneous spatial and temporal conditions. The term does not imply that social reality literally possesses the geometry of physical spacetime. It identifies a research problem: economic processes unfold through histories, delays, path dependencies, spatial distributions, institutional boundaries, and differently paced subsystems whose relations shape what can be generated later.

Time in GRE cannot be reduced to a neutral index. The order of events can matter. Early access to capital can alter later bargaining power; institutional sequencing can determine which reforms become feasible; technical standards can lock in infrastructure; educational investments can affect capabilities years later; ecological degradation can create long recovery periods. Identical quantities introduced at different moments can therefore have different generative effects.

Spatial organization is similarly relational. Geographic distance interacts with infrastructure, jurisdiction, logistics, language, data access, mobility, and ecological conditions. Digital mediation can reduce some distances while creating new forms of concentration in computation, platforms, standards, or data centers. A generative-spacetime analysis asks how locations become connected or separated through these economic relations rather than treating space as a passive container.

The programme also needs to study heterogeneous temporalities. Humans, firms, financial markets, states, ecosystems, infrastructures, and artificial systems can operate at very different speeds. Their coupling can generate asymmetry. A platform can change an algorithm faster than workers can reorganize; financial capital can exit faster than communities can replace employment; ecological recovery can be slower than investment cycles. Temporal mismatch therefore becomes an economic mechanism rather than merely a descriptive feature.

Generative spacetime should support historical reconstruction, dynamic modeling, spatial analysis, and long-horizon evaluation. Its contribution is to preserve the ordering, location, duration, and temporal coupling of generative processes. It thereby links historical analysis to formal dynamics without reducing one to the other.

3.21.9 Formal Models

Formal modeling provides GRE with tools for making assumptions explicit, deriving implications, comparing mechanisms, and exploring trajectories that are difficult to reason about verbally. The programme can draw on dynamical systems, networks, multilayer structures, agent-based models, optimization, game theory, probabilistic models, field-like representations, simulation, and other mathematical or computational techniques where they are appropriate to the object.

The architectural principle is representational pluralism under ontological restraint. A network model emphasizes connectivity; a dynamical model emphasizes state evolution; a game-theoretic model emphasizes strategic interaction; an agent-based model emphasizes local rules and emergent aggregate patterns; a field representation emphasizes distributed conditions. These models need not be translated into one universal formal language. Their adequacy depends on which features of the economic problem they preserve and which they suppress.

Formal work in GRE should state the status of each construction. Some models are descriptive summaries. Some identify structural possibilities. Some generate comparative statics or trajectories. Some serve as counterfactual laboratories. Some are fitted to empirical data; others are heuristic. A mathematically precise model can remain empirically weak if its variables or mechanisms lack adequate correspondence to the target system. Formal rigor therefore complements rather than substitutes for evidential warrant.

Generativity creates particular formal challenges. The variables, interaction structures, or effective rules may themselves change. Models can represent some forms of adaptation, network rewiring, rule learning, or changing parameters, but the programme should distinguish represented transformation from genuinely unforeseen category change. Where the formal state space excludes relevant novelty, model revision may be more appropriate than adding complexity to preserve a fixed representation.

The cumulative aim is a library of transparent formal models tied to clearly stated empirical and conceptual problems. Comparability should depend on assumptions, mechanisms, observables, and failure conditions, not on adherence to one mathematical paradigm. Formal models should remain instruments through which GRE sharpens explanation, tests implications, and explores possibilities.

3.21.10 Justice, Power, and Governance

Power and justice form a programme component because generative economic relations distribute more than current resources. They shape who can participate, who can exit, whose knowledge counts, who bears vulnerability, which alternatives remain feasible, and who captures value generated through collective processes. Governance concerns the institutional organization of these relations under persistent asymmetry and uncertainty.

Power research in GRE studies conversion mechanisms. Resource, capability, knowledge, institutional, vulnerability, and exit asymmetries become economically consequential when they can be converted into durable influence over others'

options or future conditions. The programme should identify the institutional arrangements that enable or constrain these conversions. Ownership, standards, law, infrastructure, platform design, intellectual property, credit, public authority, and organizational hierarchy can all mediate conversion.

Justice enters as a neighboring evaluative problem rather than a property automatically inferred from generativity. A highly generative arrangement can still distribute participation unequally, impose dependency, externalize harm, or foreclose alternatives. GRE therefore needs interfaces with distributive, procedural, relational, capability-oriented, ecological, and generative approaches to justice while remaining explicit about which normative principles are being used.

Governance research then asks how institutions can organize relations under conditions in which asymmetry cannot simply be eliminated. Relevant mechanisms include contestability, transparency, rights, public capacity, collective organization, auditing, representation, interoperability, liability, redistribution, and preservation of exit or voice. Each can itself generate new dependencies or concentrations. Governance must therefore be evaluated recursively.

This component connects explanation, normativity, and praxis. Its success should be judged not by whether it yields one constitutional ideal but by whether it improves the ability to diagnose power, compare governance architectures, evaluate their generated consequences, and revise institutions as relational conditions change.

3.21.11 Knowledge and Epistemic Economy

Knowledge is simultaneously an input, output, resource, relation, institution, and source of asymmetry. A GRE research programme therefore requires a substantive epistemic economy concerned with how knowledge is generated, validated, stored, circulated, priced, restricted, translated, forgotten, and converted into other forms of value or power.

The economic organization of knowledge affects who can generate further knowledge. Access to education, archives, computation, laboratories, data, journals, languages, expert communities, and institutional recognition shapes future epistemic capability. Knowledge production can therefore exhibit cumulative advantage and generative inequality even when individual information goods are non-rival. Ownership, paywalls, classification, secrecy, data governance, and platform control can influence the relational conditions of inquiry.

Epistemic economy also concerns recognition. Some observations become evidence, some questions become fundable, some methods acquire authority, and some speakers become credible. These processes are partly scientific and partly institutional. They can generate epistemic injustice when subjects are systematically excluded from contributing, being understood, or influencing the categories through which their situations are represented. At the same time, standards of evidence remain necessary; inclusion cannot mean suspension of criticism.

Artificial intelligence intensifies these questions by reducing some costs of synthesis, drafting, search, modeling, and content generation while increasing dependence on data, computation, model access, evaluation infrastructure, and epistemic filter-

ing. Abundance of generated text can make provenance, attention, verification, and question formation scarcer. The economic object is therefore not knowledge alone but the relational infrastructure through which epistemic capability is distributed.

The programme should study knowledge capital, epistemic labor, archive power, verification, provenance, scientific institutions, open infrastructure, education, and the generative conditions of inquiry. It should also examine how its own research practices distribute epistemic participation and authority.

3.21.12 Artificial Intelligence and Radical Asymmetry

Artificial intelligence provides a contemporary domain in which several GRE problems become unusually visible at once: heterogeneous subjecthood, rapid capability change, concentration of infrastructure, epistemic abundance, organizational transformation, power conversion, temporal mismatch, and uncertainty about future generative trajectories. The programme should therefore treat AI neither as a peripheral application nor as an all-explanatory paradigm. It is a demanding empirical case for testing GRE's concepts.

The central economic problem is not simply automation or substitution. AI systems can alter the cost and speed of cognition-like tasks, reorganize knowledge work, modify decision processes, enable new forms of coordination, and change who can produce valuable outputs. The consequences depend on ownership, access, interface design, labor relations, education, regulation, data, compute, and organizational capacity. Similar model capabilities can therefore produce different economic structures under different relational architectures.

Radical asymmetry refers to cases in which capability differences become large enough to transform bargaining, monitoring, production, or institutional response. Such asymmetry can occur among firms, states, workers, consumers, or human and artificial operational subjects. It does not establish moral or ontological equality among those subjects. The research problem concerns how capabilities are converted into economic power and how other subjects retain participation, contestability, learning, and exit under rapidly changing conditions.

AI also complicates the generative horizon. Systems that participate in research, design, education, administration, or cultural production can alter the rate at which new possibilities are generated. They can also narrow possibility through standardization, dependence, concentrated infrastructure, or recursive optimization around existing metrics. Evaluation must therefore attend to both capability expansion and generative foreclosure.

This component should integrate empirical labor economics, industrial organization, innovation studies, political economy, governance, epistemic economy, and technical understanding of AI systems. GRE contributes by coordinating these perspectives around relational and generative mechanisms rather than by replacing their specialized expertise.

3.21.13 Domain-Specific Applications

The final architectural component concerns domain-specific application. A research programme becomes substantive only when its concepts survive contact with cases in which institutions, evidence, values, scales, and mechanisms differ. GRE should therefore be tested across domains rather than developed indefinitely at the level of general vocabulary.

Candidate domains include labor, education, scientific research, health, finance, development, migration, humanitarian systems, urban infrastructure, digital platforms, ecological transition, public administration, innovation, culture, and international economic relations. Each domain brings specialized literatures and methods that GRE must respect. Domain application should begin from the empirical problem and available knowledge, then ask whether relational and generative analysis adds explanatory or practical value.

Applications serve several programme functions. They test concepts against heterogeneous evidence. They expose hidden assumptions imported from one domain into another. They identify mechanisms that may travel across cases and mechanisms that remain local. They provide intervention evidence. They reveal where value categories differ and where normative conflict becomes unavoidable. They can also demonstrate that GRE adds little to an already adequate established analysis, which is itself useful boundary knowledge.

Cross-domain comparison should therefore be careful. Similar labels can conceal different mechanisms. Dependency in finance, caregiving, digital infrastructure, and ecology need not be structurally identical. Generativity in education may concern capabilities and inquiry; in ecological restoration it may concern system resilience and future option spaces; in science it may concern knowledge and question formation. Comparative GRE should look for structural correspondence without presuming equivalence.

Domain-specific work also provides the main route through which the architecture remains corrigible. If concepts repeatedly fail in applied settings, they should be narrowed or abandoned. If new objects or mechanisms recur across domains, the programme can revise its typologies. If governance approaches generate predictable secondary harms, praxis should change. Application is therefore not the terminal stage of the programme. It is one of the principal sources through which the architecture itself evolves.

Taken together, these thirteen components define a preliminary architecture for GRE research. They do not form a pipeline in which epistemology is completed before methodology, methodology before substantive economics, and substantive economics before application. Work can begin in any component and move among several. An empirical anomaly can force epistemic revision; an intervention can reveal a new mechanism; a formal model can expose an ambiguous concept; a domain-specific case can require new governance categories; a normative conflict can reveal that a value representation is too coarse.

The architecture therefore functions as a coordination device. It indicates where a research question sits, which neighboring components are likely to constrain it, what forms of evidence or representation may be required, and how results can return to

the wider programme. It also gives the remaining parts of the book a common orientation: ontology and epistemology, research praxis and methodology, application-dominant intervention, substantive economic foundations, power and knowledge, artificial intelligence, domain applications, and the later disciplinary return are connected components of one revisable research programme rather than independent theoretical excursions.

The following section condenses this architecture into a preliminary constitution of GRE. That constitution does not close the field. It states, in compact form, what GRE studies, what it does not need to presume, what it attempts to explain and change, what can count as evidence and contribution, and which questions remain deliberately open to historical and theoretical revision.

3.22 A Preliminary Constitution of GRE

The preceding sections have developed Generative Relational Economics from a provisional disciplinary identity into a structured research programme. They have specified its problem-space, methodological primitives, objects and scales of inquiry, characteristic questions, analytical sequence, account of economic subjecthood, orientation of generation, modes of inquiry, epistemic commitments, praxis, normative interfaces, analysis of power and heterogeneity, disciplinary boundaries, contribution criteria, cumulative programme, internal pluralism, open problems, and wider research architecture. The role of the present section is to condense those commitments into a preliminary constitution. The term *constitution* is used here in a limited methodological sense. It denotes a compact statement of the conditions under which GRE can presently recognize its own objects, claims, evidence, interventions, contributions, and limits. It does not denote a final doctrine, a metaphysical settlement, or a fixed disciplinary code.

The objective of the section is therefore both consolidating and restrictive. Consolidation is needed because a research programme can become diffuse when its concepts expand faster than the criteria governing their use. Restriction is needed because GRE should remain distinguishable from any study that happens to mention relations, emergence, complexity, value, or future possibility. A preliminary constitution states what kinds of questions GRE takes responsibility for, which assumptions it withholds, what forms of explanation it seeks, how intervention enters the programme, what can count as evidence and contribution, and which questions remain deliberately unsettled. The method is synthetic rather than genealogical. No new lineage is introduced here. The section reorganizes the commitments already established in Chapters 1–3 into eight constitutional dimensions: domain, restraint, explanation, praxis, evidence, contribution, openness, and historical revisability.

The constitution is preliminary for a substantive reason. GRE studies processes in which relations, subjects, capacities, value structures, institutions, and conditions of generation can themselves change. A research programme directed toward such objects would contradict its own subject matter if it treated its present categories as permanently settled. Constitutional stability is therefore functional rather than absolute. The programme needs enough continuity for researchers to disagree about

the same problems, compare findings, and accumulate knowledge, while retaining enough revisability to alter its categories when empirical, historical, formal, or normative work reveals that they have become inadequate. The constitution presented below should be read in that spirit.

3.22.1 Domain and Objects of Study

GRE studies economic relations insofar as those relations help generate, reproduce, distribute, transform, or foreclose later capacities, constraints, values, subjects, institutions, trajectories, and fields of possibility. This domain statement is intentionally broader than the study of transactions and intentionally narrower than a general theory of social reality. GRE remains economic because its questions concern allocation, production, circulation, valuation, work, capability, institutional organization, economic power, dependence, resources, infrastructures, knowledge, and the conditions through which subjects participate in material and symbolic economies. It becomes generative-relational when those objects are examined through the consequences of their relational organization for what can subsequently exist, act, acquire value, coordinate, persist, or change.

The programme therefore treats the immediate recipient of an allocation or intervention as only one possible locus of effect. A subsidy may alter supplier capacity, household bargaining, regional infrastructure, expectations, or political legitimacy. An educational resource may change knowledge, confidence, social connection, question formation, institutional recognition, or later opportunity. A platform rule may change not only prices or matching efficiency but also visibility, dependence, subject formation, and the viability of alternative organizational forms. GRE asks which of these downstream effects are materially connected to the original relation and through which mechanisms they are generated. The downstream horizon is empirical and selective rather than indefinitely expansive: a GRE analysis is responsible for tracing consequences where plausible generative pathways and evidential access make them analytically relevant.

The objects admitted to this domain are correspondingly plural. Relatively stabilized entities, subjects, relations, resources, capacities, values, constraints, fields, processes, events, trajectories, institutions, social facts, and symbolic representations can each become objects of GRE inquiry. Their analytical status depends on the local problem. A firm may be treated as an entity in one study, as a field of internal relations in another, as an institutional rule complex in a third, and as a node within a wider production ecology in a fourth. GRE does not require one of these descriptions to exhaust the firm's reality. It requires the researcher to state which object construction is being used, at what scale, for which explanatory purpose, and with what evidential consequences.

The domain also includes heterogeneous subjects. Human persons, households, organizations, public bodies, communities, ecological systems, hybrid arrangements, and artificial operational agents may participate in economically consequential relations under different descriptions and with different normative statuses. Their inclusion within a common analytical field does not establish ontological or moral equivalence. It means only that their interactions can affect allocation, value, capability,

dependence, coordination, and future possibility in ways that economic inquiry may need to represent. The constitution therefore permits heterogeneous participation while reserving questions of personhood, consciousness, legal personality, moral status, and ecological standing for the appropriate neighboring domains and normative arguments.

A GRE study is consequently identified less by a proprietary object than by a characteristic relation between object and question. The same labor market, school, AI system, household, ecological project, financial institution, or humanitarian intervention can be studied through many legitimate economic approaches. It becomes a GRE problem when the inquiry asks how relational organization changes the capacities and conditions from which later economic and social possibilities are generated. This criterion preserves disciplinary openness while preventing the label GRE from becoming synonymous with any broad interest in complexity or interdependence.

3.22.2 Constitutive Restraints

GRE proceeds under several restraints that are constitutive rather than merely cautious. The first is ontological suspension. The programme can use entities, relations, processes, fields, networks, trajectories, categories, and generative structures without declaring any one of them the final metaphysical furniture of reality. Analytical usefulness establishes neither ontological priority nor completeness. A network representation may clarify connectivity; a field representation may clarify distributed conditions; a process description may clarify temporal transformation. Their value depends on the problem and the evidence. GRE therefore permits ontological commitment at the level required for a particular inquiry while withholding stronger closure.

The second restraint concerns explanatory universality. GRE does not presume that every economically relevant outcome requires a generative-relational explanation. Standard price theory, causal estimation, accounting, institutional description, optimization, historical narrative, or domain-specific expertise may already explain the relevant problem adequately. The programme earns analytical relevance where relational mediation, downstream generation, changing capabilities, path dependence, heterogeneous value, shifting subjecthood, power conversion, or transformation of future possibility materially improve understanding. The GRE label should therefore be unnecessary when a narrower account is sufficient.

A third restraint concerns generativity itself. Generation is not presumed to be beneficial, innovative, progressive, emancipatory, or just. Relations can generate dependency, exclusion, vulnerability, ecological degradation, epistemic closure, concentrated power, or the destruction of alternative futures. A highly generative system can reproduce harm more effectively than a weakly generative one. Evaluation must therefore remain separable from description. GRE can identify that a relation generates new capacities or reorganizes a field while leaving open whether that transformation should be encouraged, governed, limited, repaired, or reversed.

A fourth restraint concerns representation. Variables, categories, network edges, model states, indicators, simulations, legal classifications, and textual interpretations mediate access to the object; they are not automatically identical with it. GRE there-

fore distinguishes relational reality from its representation and treats boundary choice, measurement, coding, scale selection, and model specification as substantive parts of inquiry. This restraint is especially important where categories can become performative. Rankings, credit scores, eligibility classifications, productivity metrics, and AI-generated representations may alter the relations they purport to describe. The research instrument can become part of the generative field.

A fifth restraint concerns scalar and historical invariance. GRE does not assume that an object retains the same analytical identity across scale or historical transformation. A configuration that is stable enough to be treated as an entity at one level may decompose into changing relations at another. Categories such as worker, household, capital, platform, intelligence, capability, value, or market can change their institutional content over time. The constitution therefore requires explicit scale, boundary, and historical conditions whenever they materially affect the claim.

These restraints make the programme deliberately non-totalizing. They protect methodological pluralism, disciplinary interfaces, and corrigibility. They also impose costs: GRE must often carry more uncertainty, specify more boundaries, and resist attractive universal formulations. Those costs are accepted because a programme concerned with changing relations and future possibility requires a disciplined distinction between useful analytical commitment and premature closure.

3.22.3 Explanatory Commitments

GRE attempts to explain how economic outcomes and future possibilities arise through relations that mediate allocation, interaction, interpretation, institutional recognition, capability, and value. Its characteristic explanatory move is from a local intervention or observed configuration toward the mechanisms through which effects propagate and reorganize later conditions. This move does not replace causal inference. It expands the range of causal and generative questions that may need to be asked when the object cannot be understood adequately as an isolated unit responding to fixed incentives or constraints.

A generative explanation should identify more than temporal succession. It should specify a plausible mechanism connecting relational conditions to later changes. The mechanism may involve resource transfer, learning, coordination, reinforcement, institutional authorization, recognition, imitation, network exposure, expectation formation, technological complementarity, legal change, ecological feedback, symbolic classification, or another documented process. Claims of generation should remain proportionate to the degree to which such mechanisms can be evidenced. Where mechanism is uncertain, GRE should state the uncertainty rather than substituting the vocabulary of emergence for explanation.

The programme is especially interested in recursive transformation. Economic processes can change the conditions under which later processes operate. A policy can alter not only behavior but institutional trust; a technology can alter not only productivity but the skills and infrastructures required for participation; a market can alter not only allocation but the kinds of actors able to survive within it; an AI system can alter not only task performance but the organization of expertise, attention, and decision authority. In such cases, the effective rule governing later change may differ

from the rule that characterized the earlier system. GRE therefore treats transformation of generative conditions, and where warranted transformation of effective rules, as explanatory objects in their own right.

Explanation also requires attention to propagation, conversion, recirculation, dissipation, and extraction. Generated value can move among subjects and institutions, change form, accumulate, decay, or be captured. Knowledge can become capability; capability can become bargaining power; symbolic recognition can become access; ecological capacity can become economic resilience; public infrastructure can become private rent; care can sustain labor capacity without appearing in market price. GRE does not presume that these conversions are complete or commensurable. It seeks to identify the relations through which they occur and the losses, exclusions, and asymmetries that accompany them.

Power enters this explanatory programme as the conversion of asymmetry into durable influence over others' options, vulnerabilities, representations, exit conditions, or future generative possibilities. Resource asymmetry, capability asymmetry, knowledge asymmetry, institutional authority, vulnerability, and exit conditions can each contribute to power when relational conditions allow them to be converted into leverage. This formulation avoids treating all difference as domination while making the reproduction of asymmetry economically analyzable.

GRE also attempts to explain orientation. Economic systems do not only produce outputs; they distribute attention, visibility, curiosity, legitimacy, funding, search capacity, and institutional recognition. These processes influence which possibilities receive the conditions required for further development. An account of generation is therefore incomplete when it describes capacity while ignoring the mechanisms that direct capacity toward some questions, designs, values, or futures rather than others. Orientation can be intentional, institutional, market-mediated, algorithmic, cultural, or emergent. Its explanation belongs within the economic problem-space when it affects resource allocation and future generative capacity.

The constitutional explanatory commitment can therefore be summarized without reducing it to one model: GRE seeks mechanisms linking relational organization to the emergence, persistence, transformation, distribution, or foreclosure of later economic possibilities. Different studies may instantiate that commitment through historical reconstruction, causal inference, formal modeling, computational exploration, qualitative mechanism tracing, comparative inquiry, or combinations of these modes. The explanatory standard lies in the clarity of the claim and its warrant, not in adherence to one technique.

3.22.4 Praxis and Transformative Orientation

GRE is not constituted only as a descriptive programme. It also includes praxis: the disciplined movement from explanation toward intervention under incomplete knowledge. This practical orientation follows from the object of inquiry. If economic relations shape later capacities, dependencies, values, and possibilities, then allocation and governance decisions participate in the generation of future conditions. The research programme should therefore be capable of informing intervention while remaining explicit about the uncertainty and normative judgment that intervention

introduces.

Praxis begins with diagnosis rather than prescription. A relational diagnosis identifies the relevant subjects, institutions, infrastructures, dependencies, boundaries, and scales. A generative diagnosis asks which of those relations reproduce present conditions and which enable or foreclose change. Intervention design then specifies what is being altered: resources, constraints, access, recognition, information, rights, infrastructure, incentives, coordination mechanisms, or other conditions. This sequence prevents the language of generativity from becoming a license for indiscriminate experimentation.

Allocation is treated within this praxis as a relational intervention. The economic significance of allocating money, rights, infrastructure, education, information, or computational capacity depends on the relations into which the allocation enters. Identical resources can produce different effects under different conversion factors, institutional rules, recognition structures, ecological conditions, and power relations. GRE therefore asks how an intervention changes the field through which resources become capabilities and how those new capabilities affect other subjects and future options.

Intervention generates evidence as well as effects. Feedback, implementation failure, unanticipated dependence, unequal uptake, symbolic reinterpretation, ecological response, and strategic adaptation can reveal relations that were poorly represented in the initial model. GRE praxis should therefore preserve mechanisms for revision during and after intervention. Adaptive governance is valuable where it institutionalizes learning without turning affected populations into uncontrolled experiments. The practical requirement is not endless flexibility but explicit conditions under which evidence triggers continuation, modification, scaling, suspension, or termination.

Withdrawal, reversal, and repair form part of this constitutional praxis. Interventions can become harmful, obsolete, captured, or self-reinforcing in ways that diverge from their original aims. A programme concerned with generative effects must ask whether the conditions produced by an intervention can be undone and what restoration would actually mean after the system has changed. Repealing a rule may fail to recreate the earlier state because capabilities, expectations, infrastructures, relationships, and subject positions have already been transformed. Reversibility is therefore an empirical property, not an administrative assumption.

The transformative orientation of GRE remains normatively open in a specific sense. The programme can analyze which interventions expand participation, capability, resilience, plurality, or future possibility, but it does not derive a complete moral ordering from generativity alone. Normative appraisal can draw on justice theory, ethics, law, democratic processes, domain-specific standards, and the neighboring GREthic programme. Praxis is thus constituted by an obligation to connect explanation with action where useful, paired with an obligation to keep empirical mechanism and normative justification distinguishable.

3.22.5 Evidential Admissibility

GRE adopts evidential pluralism constrained by claim-specific standards. Evidence is admissible when it bears materially on the claim being made and when the path from observation or representation to inference is sufficiently explicit for criticism. The constitution therefore does not privilege one evidential form in advance. Administrative records, prices, transactions, experiments, quasi-experiments, surveys, interviews, ethnography, archives, legal materials, organizational documents, ecological measurements, network data, computational traces, comparative cases, formal implications, simulations, and intervention records can all contribute, but they warrant different kinds and strengths of claims.

Descriptive evidence can establish patterns without identifying mechanisms. Causal designs can estimate specified effects without exhausting interpretation or historical formation. Historical evidence can reconstruct sequence, contingency, and institutional development without producing a universal parameter estimate. Interpretive evidence can establish how categories, meanings, or obligations are understood by participants without by itself identifying every material consequence. Formal models can show what follows from specified assumptions without demonstrating that the target system satisfies those assumptions. Simulations can explore implications, sensitivity, and possible dynamics without becoming observations of the world merely through computational complexity. These distinctions are constitutional because GRE depends on combining modes without conflating their warrants.

Evidence for generative claims requires particular care. A downstream change occurring after an intervention is insufficient by itself to establish generation. Researchers should specify a mechanism, consider alternative pathways, examine temporal ordering, identify relevant mediators, and state the boundary over which the claim is intended to hold. Where direct identification is impossible, triangulation among historical, qualitative, quantitative, formal, or comparative evidence can strengthen the claim while preserving residual uncertainty. The programme accepts graded evidence; it does not require false certainty before relational mechanisms can be studied.

Counterfactual reasoning is often unavoidable. Claims about capability, foreclosure, resilience, opportunity, or future possibility concern alternatives that may never be fully observed. Evidence can include comparison across cases, natural experiments, historical alternatives, participant knowledge, structural models, simulation, sensitivity analysis, or explicit scenario construction. The relevant standard is transparency about which counterfactual is being invoked and why it is credible enough for the intended claim. Counterfactual richness should not be confused with evidential freedom.

Negative and disconfirming evidence also belongs within GRE. Failed interventions, absent downstream effects, unstable mechanisms, measurement failure, non-transportable cases, and situations in which a simpler established theory outperforms a GRE formulation should be retained as programme knowledge. Such evidence narrows the field's domain and improves theory comparison. A research programme that records only successful generative narratives would systematically

exaggerate its own explanatory scope.

Finally, evidence is historically situated. Data availability, categories, archives, measurement systems, institutional visibility, and computational capacity change over time. Some subjects leave extensive traces while others remain under-recorded; some value forms are priced while others are rendered administratively invisible. GRE therefore treats the evidential environment itself as potentially structured by power and institutions. Evidential admissibility includes attention to whose relations can be observed, which histories can be reconstructed, and which absences may reflect the organization of recording rather than the absence of the phenomenon.

3.22.6 Criteria of Contribution

A contribution to GRE is constituted by the structure of its research claim rather than by the presence of GRE terminology. At minimum, a recognizable contribution should specify the relational problem, the relevant scale and boundary, the generative or relational claim being advanced, and the evidence or representation that bears that claim. It should distinguish the modeled or represented relation from the target relation, calibrate its inference to the available warrant, and identify material alternative mechanisms where they are plausible.

A contribution may be conceptual. It can clarify a category, distinguish previously conflated mechanisms, develop a typology, or revise the programme's ontology under suspension. It may be empirical, identifying a generative relation or demonstrating a boundary condition. It may be historical, reconstructing how an economic subject, institution, value form, or generative condition emerged. It may be formal, providing a model that clarifies a mechanism or reveals implications. It may be computational, exploring dynamics inaccessible to analytic derivation. It may be normative, identifying evaluative conflicts or consequences that existing frameworks obscure. It may be practical, producing intervention evidence or governance procedures. No one form is constitutively superior.

GRE contribution also requires downstream discipline. A study need not trace every consequence of an intervention or relation, but it should explain why the chosen horizon is adequate to the research problem and acknowledge plausible effects excluded by that boundary. Where a claim concerns generativity, the analysis should identify what is being generated, for whom or for what system, through which mechanism, over what time horizon, and under what conditions. The term *generative* should carry analytical content rather than function as a general synonym for productive, innovative, or beneficial.

Normative transparency is another criterion. Researchers should distinguish descriptive claims, explanatory claims, forecasts, evaluations, and recommendations. If a contribution favors participation, capability, equality, resilience, pluralism, ecological integrity, autonomy, or another normative objective, the evaluative premise should be stated rather than embedded invisibly in the language of system improvement. GRE can support normatively engaged research while preserving the difference between evidence about consequences and judgment about their desirability.

Contribution further requires reproducibility or interpretive traceability appropriate to the method. Quantitative and computational work should expose data con-

struction, assumptions, code, parameters, and sensitivity where feasible. Historical and qualitative work should make source selection, interpretive steps, category construction, and evidential tensions sufficiently visible for another researcher to understand how the conclusion was reached. Formal work should state assumptions and domains of applicability. Traceability is the general constitutional requirement; exact replication is one method-specific realization.

The final criterion is cumulative relevance. A GRE contribution should leave the programme better able to inquire afterward. It may supply a reusable concept, map, dataset, mechanism, comparative case, formal model, indicator, intervention record, negative result, or theory revision. Cumulative relevance includes contraction. Demonstrating that a concept is too broad, a mechanism fails outside a narrow domain, an indicator systematically distorts value, or an intervention generates recurrent harm is a positive research contribution because it improves the programme's capacity to avoid error.

3.22.7 Open Constitutional Questions

The preliminary constitution deliberately leaves major questions open. The first concerns identification. Generative relations are often distributed, mediated, and historically formed, making it difficult to determine which relation produced which downstream capacity or constraint. Better causal designs, process tracing, comparison, formalization, and computational methods may improve identification, but some relations remain reflexive or multiply realized. The programme does not assume that every generative effect can eventually be assigned to a single source.

A second open question concerns measurement. Generativity can refer to capability formation, relation formation, value propagation, diversification of future possibilities, resilience, subject formation, institutional transformation, or changes in the effective rules of change. These may require different measures and may resist reduction to one scalar index. Measurement research should therefore explore domain-specific indicators, multidimensional representations, and comparative procedures without presuming a universal generativity metric.

A third concerns value. Economic relations can generate several forms of value simultaneously and can convert value across domains imperfectly. Monetary price, capability, symbolic recognition, ecological capacity, care, knowledge, institutional trust, public infrastructure, and future option value cannot be presumed fully commensurable. GRE requires practical ways to compare and govern heterogeneous values while preserving information about what is lost through commensuration. The relation between such comparisons and normative justification remains open.

A fourth concerns boundaries and scale. Relational systems rarely arrive with uniquely given analytical borders. Expanding a boundary can reveal hidden dependencies while making causal identification harder; narrowing it can improve tractability while externalizing relevant effects. Scale changes can also alter what counts as an entity, mechanism, or outcome. GRE therefore needs stronger procedures for boundary sensitivity, multiscale inference, and the comparison of explanations constructed at different resolutions.

A fifth concerns changing transformation rules. When institutions, technologies,

categories, expectations, or subject capacities evolve, the model adequate to an earlier period may cease to describe the later system. Some of this can be handled through time-varying or adaptive models; some may require changes in variables and model classes themselves. Distinguishing parameter change from structural change, and structural change from the emergence of new relevant categories, remains a central theoretical and empirical problem.

A sixth concerns justice and governance under persistent asymmetry. Economic relations often depend on differences in capability, information, authority, vulnerability, and exit. Equalization can be desirable in some dimensions while infeasible or counterproductive in others. Counter-power can reduce domination while creating new gatekeepers. Governance must therefore organize asymmetry while preserving participation, contestability, learning, and repair. The programme leaves open which institutional forms achieve those aims under different material and cultural conditions.

A seventh concerns heterogeneous subjects and artificial intelligence. Operational agency, legal personality, moral status, consciousness, accountability, and economic capability can diverge. AI systems can become economically consequential without resolving philosophical questions about machine subjecthood. GRE needs analytical conventions that allow such systems to be studied as participants or mediators where appropriate while preventing capability measures from silently determining ontological or normative status.

An eighth concerns long horizons. Generative effects can unfold across careers, institutions, ecosystems, and generations. Evidence weakens as horizons extend, while path dependence and rule change make extrapolation increasingly uncertain. Yet short-horizon evaluation can systematically favor interventions that consume the conditions of future possibility. Developing responsible long-horizon analysis without manufacturing spurious precision remains one of GRE's most important open problems.

These questions are constitutional because their unresolved status shapes how the programme should behave. Openness does not imply that anything is permitted. It means that GRE should preserve competing formulations, record uncertainty, compare methods, and allow evidence from later chapters and future research to revise the present constitution. A preliminary constitution identifies the space of legitimate disagreement as much as it identifies present commitments.

3.22.8 Historical Revisability of the Programme

GRE is constituted as a historically situated research programme. Its emergence is connected to changes described in Chapter 1: expanded relational production, globalization, digital mediation, artificial intelligence, ecological constraint, changing scarcity, capability asymmetry, new scientific and computational capacities, and altered conditions of evidence and governance. These conditions make certain relational and generative questions more visible and more tractable. They do not make GRE historically inevitable, universally necessary, or permanently adequate.

Historical situatedness has two implications. First, GRE concepts should be expected to change as the economy changes. Categories useful for contemporary

platform economies, AI-mediated production, or ecological transition may require revision under future institutional and technological arrangements. New forms of subjecthood, coordination, property, value, or infrastructure may emerge. Existing distinctions may lose relevance. A theory of historically changing economic reality should preserve the capacity to revise the categories through which it recognizes that reality.

Second, standards of inquiry can also evolve. New measurement technologies, archives, computational methods, legal institutions, participatory procedures, and epistemic practices can change what relations are observable and what interventions are ethically or practically possible. Methods and evaluative procedures therefore possess histories of their own. GRE should record those histories and remain capable of re-evaluating earlier findings when the epistemic resources available to later inquiry change. Revisability applies to methods and standards as well as to substantive theory.

Revision should nevertheless remain disciplined by programme memory. The replacement of one concept by another should preserve the reasons for the change; abandoned indicators, failed models, negative cases, and superseded mechanisms should remain accessible where possible. Otherwise a field can mistake forgetting for innovation. Cumulative knowledge requires both inheritance and correction. A historically revisable constitution therefore needs archives of its own revisions.

The present constitution can be revised through several routes. Empirical anomalies can show that a proposed relation does not operate as expected. Comparative work can reveal that a mechanism is culturally or institutionally specific. Formal work can expose inconsistency or hidden assumptions. Intervention can reveal unanticipated dependence or harm. Normative inquiry can show that an apparently desirable generative process rests on unjust relations. Historical analysis can demonstrate that a category treated as natural is institutionally recent. Domain applications can reveal objects that the existing typology cannot adequately represent. Each route provides a legitimate basis for constitutional amendment when the evidence is strong enough.

Revisability also protects GRE from disciplinary self-insulation. The programme should remain in dialogue with mainstream economics, political economy, economic sociology, complexity and evolutionary economics, capability approaches, ecological economics, legal and institutional analysis, philosophy, computer science, and other relevant fields. GRE has no constitutional entitlement to retain a concept merely because it originated within the programme. Where neighboring theories explain a problem better, GRE should borrow, narrow its own claim, or withdraw it. The integrity of the programme depends more on its capacity for correction than on the preservation of a proprietary vocabulary.

A preliminary constitution therefore combines continuity with amendability. GRE presently studies economic relations through their role in generating, distributing, transforming, and foreclosing later capacities and possibilities. It proceeds under ontological suspension, evidential pluralism, boundary and scale transparency, methodological pluralism, normative separability, and explicit attention to power, heterogeneity, historical dependence, and recursive change. It seeks explanations that identify mechanisms, praxis that remains revisable under feedback, contributions that

are traceable and cumulative, and a programme architecture capable of learning from failure as well as success. These commitments are strong enough to coordinate inquiry while remaining open to revision.

Chapter 3 thereby completes the preliminary constitution of Generative Relational Economics and closes Part I. Chapter 1 reconstructed the historical conditions under which the programme becomes intelligible; Chapter 2 reconstructed the intellectual lineages that make its conceptual vocabulary possible; Chapter 3 has stated the provisional research programme that follows from those conditions and inheritances. Part II now turns from constitution to deeper theoretical development. Chapter 4 examines the ontological view of Generative Relational Theory, beginning with the degree and form of ontological commitment that relational and generative inquiry requires. The constitution established here should therefore be treated neither as an endpoint nor as a summary detached from what follows. It is the provisional compact against which the later ontology, epistemology, methodology, formalization, political economy, governance, and applications of the book can be tested and revised.