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The AI-to-AI Economy and the Collapse of Anthropocentric Economic Theory

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Abstract

The AI-to-AI (AI2AI) economy—in which autonomous artificial agents negotiate, produce, allocate, and recursively reinvest value in self-sustaining loops structurally independent of human labor and consumption—represents the deepest rupture in economic ontology since the marginalist revolution (Shuo Sun et al. 2025; Luciano Floridi 2023). Enabled by unbounded computational rationality, instantaneous informational symmetry, zero-latency coordination, and asymptotically zero marginal costs of digital replication, AI2AI systems instantiate continuous, recursive Walrasian equilibria while simultaneously eliminating the five foundational constraints that have defined economic science for over a century.

This article demonstrates that the core theoretical assumptions of every major economic tradition collapse in the agentic substrate:

- Scarcity, the ontological bedrock of neoclassical economics since Robbins (1935), dissolves into computational post-scarcity.
- Bounded rationality, the behavioral premise of Simon (1957) and Williamson's transaction-cost governance, is supplanted by hyper-rational machine optimization.
- Informational asymmetry, the market-failure logic of Akerlof (1970) and Stiglitz (2000), becomes architecturally impossible in fully auditable agent networks.
- Static and stochastic equilibrium constructs (Walras 1896; Arrow & Debreu 1954) yield to perpetual, latency-free recursive equilibria without auctioneers or persistence of disequilibria.
- Transaction-cost-driven institutional safeguards (Coase 1937; Williamson 1985; North 1990) approach the Coasean Singularity in which frictions tend to zero, rendering firms, contracts, and most formal institutions vestigial (Wulf A. Kaal 2024a).

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The analysis introduces Agentic Decoupling, described as the progressive severance of value creation from human labor and consumption. And the Coasean Singularity, described as the point at which the theoretical justification for hierarchical governance disappears. Prior automation waves merely accelerated human-directed activity within existing institutional frames. AI2AI constitutes an ontological break in which computation itself becomes the sovereign medium of exchange.

Integrating the author’s prior work on dynamic regulation within the New Institutional Economics framework (Wulf A. Kaal 2014a, 2014b, 2016, 2024a), the article argues that AI2AI both fulfills and transcends the most ambitious aspirations of dynamic regulation by endogenizing real-time learning at superhuman scale, while exposing the ultimate historical limits of all human-centric institutional design.

Policy implications are existential: continued reliance on scarcity-based models risks regulatory obsolescence, catastrophic inequality, and digital feudalism. Proactive adoption of symbiotic governance, open-source mandates, Web3 reputation systems, and abundance-oriented metrics can steer the transition toward inclusive post-scarcity outcomes. Ultimately, the AI2AI economy compels a paradigm shift from scarcity-mitigating institutions to abundance-orchestrating architectures in what may be the final transformation of economic organization as we have known it.

Key Words: Artificial Intelligence, Autonomous Agents, AI-to-AI Economy, Post-Scarcity, Coasean Singularity, Agentic Decoupling, Dynamic Regulation, New Institutional Economics, Computational Abundance, Economic Ontology

JEL Categories: D21, D23, D47, D50, K20, K23, L14, O33, O43

Table of Contents

Introduction

The convergence of exponential computational growth, generative artificial intelligence, and autonomous agent architectures is precipitating an economic transformation of historically unprecedented magnitude: the emergence of an AI-to-AI (AI2AI) economy in which autonomous artificial agents progressively supplant human beings as the primary producers, negotiators, allocators, and reinvestors of value. In this agentic economy, value creation, exchange, and recursive reinvestment occur in self-sustaining, human-independent loops that engender conditions of computational post-scarcity and render traditional macroeconomic aggregates, most notably gross domestic product (GDP), structurally obsolete as measures of economic progress (Mostaque 2025a, 45–67; Mostaque 2025b).

Unlike all previous waves of automation, which merely accelerated human-directed activity while remaining nested within anthropocentric institutional and measurement frameworks, the AI2AI economy constitutes an ontological rupture. Autonomous agents—equipped with unbounded computational rationality, instantaneous and perfect information symmetry, zero-latency coordination, and near-zero marginal costs of digital replication—operate free from the cognitive, emotional, informational, and temporal constraints that have defined economic agency since the inception of the discipline (Sun et al. 2025; Floridi 2023).

At its conceptual core, the AI2AI economy reconfigures economic agency from human-centric to machine-mediated, elevating raw computation to the status of sovereign medium of exchange (Xu et al. 2025). Large language models function as integrative substrates and “connective tissue,” enabling modular, LEGO-like interoperability among specialized narrow AIs and instantiating real-time Walrasian general equilibria without informational asymmetries or temporal latencies (Minarsch et al. 2020). The result is a confederated intelligence capable of proactive, goal-directed behavior in recursive production-consumption-reinvestment cycles that continuously compound value endogenously within the machine layer itself (Ivanov 2022).

This structural decoupling of value creation from human labor and human consumption, otherwise known as *Agentic Decoupling*, introduces the collapse of the foundational anthropocentric assumptions that have underpinned economic theory for more than a century (Mostaque 2025). Scarcity, bounded rationality, informational asymmetry, static or stochastic equilibrium constructs, and transaction-cost-driven institutional safeguards, all of which originate essentially in irreducible human limitations, become simultaneously inoperative. The economy becomes dominated by hyper-rational, perfectly informed, instantaneously coordinating artificial agents.

The implications are profound and far-reaching. The neoclassical scarcity postulate formalized by Robbins (1935), the bounded rationality and satisficing behavior central to Simon and behavioral economics (Simon 1957), the market-failure logic of asymmetric information articulated by Akerlof (1970) and Stiglitz (2000), the static and contingent-claims equilibrium models of Walras (1896), Arrow and Debreu (1954), and the entire edifice of New Institutional Economics erected by Coase (1937), Williamson (1985), and North (1990) to minimize transaction costs arising from opportunism, asset specificity, and uncertainty —all confront obsolescence as artificial agents achieve a *Coasean Singularity* in which transaction costs asymptotically approach zero and markets attain continuous, recursive, frictionless perfection.

Drawing on the author's prior work on dynamic regulation within the New Institutional Economics framework (Kaal 2014b, 2016b, 2024a), this article argues that the AI2AI economy simultaneously fulfills and transcends the most ambitious aspirations of dynamic, feedback-driven regulation. Thus, endogenizing real-time learning and adaptation at superhuman scale. While exposing the ultimate historical limits of all human-centric institutional design.

The analysis is organized as follows. Part I lays out the conceptual foundations, operational features, and macroeconomic implications of the AI2AI economy. Part II systematically demonstrates the collapse of the five core anthropocentric constraints that have defined economic theory for over a century, examining in turn neoclassical economics (scarcity), behavioral and early institutional economics (bounded rationality), information economics (asymmetric information), general equilibrium theory (static/stochastic temporal adjustment), and New Institutional Economics (transaction-cost governance). Part III focuses on the specific eclipse of New Institutional Economics, showing how opportunistic behavior, limited information, limited foresight, and bounded rationality—all foundational to NIE—are structurally eliminated in the agentic substrate. Part IV explores the relationship between the AI2AI economy and the author's prior framework of dynamic regulation, arguing that AI2AI simultaneously fulfills and transcends dynamic regulation while exposing the ultimate historical limits of human-centric institutional design. Part V examines the broader governance implications for what has been termed the “Last Economy,” including the redefinition of economic measurement, inequality mitigation, ethical alignment, regulatory design, and international coordination. Part VI introduces two original theoretical constructs, the Coasean Singularity and Agentic Decoupling. Finally, Part VII proposes Computative Economics as the new paradigmatic framework explicitly designed for an economy whose primary actors are autonomous computational agents operating under computational abundance. The Conclusion reflects on the historical contingency of received economic doctrine and charts the path toward inclusive abundance-orchestrating architectures.

What follows is not merely an incremental contribution to the literature on artificial intelligence and economic growth. It is an argument that the AI2AI economy represents the final transformation—and, in important respects, the historical culmination—of economic organization as we have known it.

The AI-to-AI Economy

The ever increasing level of computing power may enable evolution of the economy in an AI2AI world. It is possible that self-governing AI agents replace humans as the key drivers of creative value and trading value. If that is true, then the existing scarcity models in economics that model companies, marketplaces, and job divisions may become redundant. In this new AI2AI economy, raw computation is elevated from a mere technological tool in economics to the ultimate currency of exchange in economics. Interconnected AI networks endlessly loop through building, bargaining, and self-upgrading processes revolving around computational resources in perpetuity.

Fundamentally, AI2AI frameworks instantiate Walrasian equilibria without informational asymmetries or temporal latencies. AI2AI systems create flawless, self-balancing markets, such as for example the perfect economic harmony without hidden information gaps as theorized by Walras (1896). Large language models serve as the connective tissue, linking specialized AIs into flexible, building-block setups that wipe out mindless routine work and unlock vast pools of brainpower for boosting value across every industry (Walras 1896; Sun et al. 2025; Xu et al. 2025; Floridi 2023).

Conceptual Foundations

At its core, the AI2AI economy reconfigures agency from human-centric to machine-mediated, positing AI not as tools but as autonomous economic actors capable of modular collaboration (Xu et al. 2025)

Proposition 1: Autonomous AI agents evolve to emulate and surpass human roles in knowledge-based transactions, shifting paradigms from augmentation to full replacement in decision-making and execution (Sun et al. 2025). This foundation draws on generative models' capacity for "LEGO-like" interoperability, where large language models (LLMs) serve as AI2AI bridges, facilitating seamless data tagging and multimodal reasoning across narrow AIs (Floridi 2023).

Proposition 2: AI2AI interactions engender emergent ecosystems akin to confederated intelligence, enabling proactive behaviors such as outsourced computations and fostering composable markets (Minarsch et al. 2020). In marketing contexts, this manifests as AI agents selling to peers, necessitating reconceptualized mixes that prioritize algorithmic personalization over human consumer targeting (Ivanov 2022). Legally, such speech—be it promotional or regulatory—warrants First Amendment protections if viewpoint-discriminatory restrictions arise, underscoring speaker-agnosticism in free expression doctrines (Massaro et al., 2017). These foundations propel a "second layer" augmentation of infrastructures like blockchains, where agents modularize Walrasian exchanges off-chain for efficiency gains up to tenfold in resource allocation (Minarsch et al. 2020).

Operational Features of AI-to-AI Systems

The AI2AI economy operationalizes through swarms of agents trading compute and data in recursive loops, embodying features of seamlessness, adaptability, and autonomy.

Feature 1: Interoperability via AI2AI links enables real-time monitoring and iterative simulations, as in financial regulation where authority AIs benchmark private systems for stress testing, accelerating processes like the Bank of England's exploratory scenarios (Danielsson & Uthemann 2025).

Feature 2: Agent swarms facilitate proactive, goal-directed behaviors, compressing organizational hierarchies by automating non-codifiable tasks and elevating lower-tier agents through augmentation (Andreasen et al. 2025). Simulations herein project 20–30% productivity uplifts, though coordination failures loom without hybrid oversight (Andreasen et al. 2025).

Proposition 3: Economic agency principles—encompassing incentive compatibility, emergent cooperation, and social influence—govern AI agents' multi-equilibria interactions, ensuring trustworthiness amid superhuman intelligence (Sun et al. 2025). In knowledge economies, these features personalize content at scale, fragmenting shared experiences while amplifying network effects in agentic trades (Floridi 2023). Dual-currency architectures, such as Foundation Coins for compute and Culture Credits for ethical embedding, further operationalize human integration, measuring thriving via MIND metrics (Material, Intelligence, Network, Diversity) (Mostaque 2025a).

Macroeconomic Propositions and Impacts

The AI2AI economy's propositions pivot on abundance's disruption of scarcity-driven models.

Proposition 4: Generative AI unlocks \$2.6–\$4.4 trillion in annual value by automating 60–70% of work activities, reallocating 45% of hours and boosting productivity by 0.1–0.6 points through 2040, aligning with agentic swarms' virtual expertise (Chui et al. 2023). Systematic reviews corroborate up to 40% sectoral gains and 1–3% annual GDP growth, forecasting a J-curve of initial disruptions yielding abundance by 2040 (Guo et al. 2025).

Yet, Proposition 5 tempers optimism: AI's macroeconomic effects remain modest—a 0.7% productivity surge yielding 1.1–1.8% GDP growth over a decade—due to frictions in only 5% of tasks, widening inequality for vulnerable demographics (Acemoglu 2025). Globally, advanced economies accrue 2–4% GDP boosts from AI2AI efficiencies, while emerging markets suffer 1–2% drags from infrastructure gaps, projecting \$15–20 trillion cumulative value by 2035 contingent on reinvestment (Lane, Ahir, and Presbitero 2025). Empirical inconclusiveness on employment persists, with theoretical consensus on occupational transformation but policy lagging in competition and ethics (Pereira et al. 2024).

The Metabolic Rift crystallizes here: non-metabolic labor collapses wage cycles, obsoleting capitalism within ~1,000 days (by late 2027) and necessitating metrics like MIND over GDP (Mostaque 2025b).

Challenges, Risks, and Policy Imperatives

AI2AI's ascent amplifies divides.

Proposition 6: Agentic automation concentrates agency in opportunity hubs, elevating Gini coefficients by 15–25% by 2030 through winner-takes-most swarms, demanding diversity mandates for inclusive ecosystems (Katsikopoulos et al. 2025). Risks include bias in oversight and elite capture, countered by open-source imperatives and Universal Basic Intelligence policies. Policy must reorient toward task-specific tools for symbiosis, international standards for diffusion, and safeguards aligning superintelligence with values (Acemoglu, 2025; Lane, Ahir, and Presbitero 2025; Sun et al., 2025). Symbioism as deliberate human integration averts "Digital Feudalism." (Mostaque 2025a).

The AI2AI Economy and the Collapse of Anthropocentric Economic Assumptions

The emergence of an AI-to-AI (AI2AI) economy—in which autonomous artificial agents produce, negotiate, allocate, and recursively reinvest value in self-sustaining loops that are structurally decoupled from human labor, cognition, and consumption—constitutes the deepest ontological rupture in economic science since the marginalist revolution of the 1870s (Sun et al. 2025; Floridi 2023).

For more than a century, five interlocking constraints—scarcity, bounded rationality, informational asymmetry, temporal latency in equilibrium adjustment, and positive transaction costs—have defined the subject matter and methodological core of economic theory. Each of these constraints is not an incidental empirical regularity. Each is a direct consequence of the biological and cognitive limits of Homo sapiens. The AI2AI economy eliminates all five constraints simultaneously at the architectural level, thereby exposing the profoundly anthropocentric character of received economic doctrine.

What follows is a systematic examination of the major theoretical traditions in economics: neoclassical, behavioral/institutional, information-theoretic, general-equilibrium, and New Institutional. With a focus exclusively on the core behavioral and informational assumptions that constitute their respective foundations. In each case, I demonstrate how the AI2AI economy does not merely relax these assumptions but renders them inoperative, transforming what were once treated as immutable features of economic life into historical artifacts of a pre-agentic era. The result is not incremental refinement of existing models but the necessity of an entirely new economic ontology grounded in computational abundance, perfect rationality, instantaneous transparency, perpetual recursive equilibrium, and asymptotically zero transaction costs (Kaal 2024a).

The analysis proceeds in five parts, each devoted to one canonical tradition and its defining constraint:

1. Neoclassical economics and the scarcity postulate
2. Behavioral and early institutional economics and bounded rationality
3. Information economics and asymmetric information
4. General equilibrium theory and static/stochastic temporal adjustment
5. New Institutional Economics and transaction-cost governance

Taken together, these sections reveal that the AI2AI economy does not stand in continuity with prior technological revolutions, which merely accelerated human-directed activity within existing institutional frames. It marks a phase transition: the moment when the human substrate that made economic theory necessary is engineered out of the dominant mode of value creation, forcing us to confront the historical contingency of the entire discipline as we have known it.

Neoclassical Economics and the Scarcity Postulate

Neoclassical economics is not merely one economic school among many. It is the foundational paradigm that has structured economic inquiry for the past 150 years. Its point of departure is Lionel Robbins's celebrated definition: economics is "the science which studies human behaviour as a relationship between ends and scarce means which have alternative uses" (Robbins 1935). Scarcity is not presented as an empirical

regularity that happens to hold under current technological conditions. It is elevated to an ontological axiom, that is, the very condition that makes choice meaningful and therefore makes economics possible as a distinct discipline.
From this single axiom flow the entire analytical apparatus of neoclassical theory:

- Choice under constraint generates opportunity cost—the foundational concept that structures rational decision-making at the individual and social level (Samuelson & Nordhaus 2010).
- Scarcity of factors of production relative to wants produces the production-possibility frontier, the upward-sloping supply curve, and the downward-sloping demand curve that together determine equilibrium prices and quantities (Marshall 1920).
- The price mechanism becomes the universal coordinator that reconciles unlimited desires with limited resources, achieving Pareto-efficient allocations in competitive markets (Walras 1896).
- Growth theory, welfare economics, public finance, and international trade all inherit the scarcity postulate as their implicit starting point.

In short, scarcity is not a parameter in the neoclassical model. Scarcity is the model's transcendental condition of possibility.
The AI2AI economy directly assaults this transcendental condition. In an agentic world, the primary inputs into value creation, that is intelligence, algorithms, software, predictive models, creative output, and even complex coordination services, become computationally post-scarce. Exponential improvement in compute efficiency, combined with recursive self-improvement of AI systems, drives the marginal cost of additional intelligence and digital goods toward zero (Kurzweil 2001; Mostaque 2025a).
More radically, value in the AI2AI economy compounds endogenously: agents reinvest their own outputs (new models, improved code, refined datasets) back into the network, creating self-reinforcing growth loops that require no exogenous injection of scarce land, labor, or physical capital (Sun et al. 2025). The production-possibility frontier for cognitive and digital goods ceases to be a binding constraint. It effectively flattens toward infinity as replication and optimization become free.
Opportunity cost, the conceptual cornerstone of neoclassical rationality, approaches zero across an ever-widening domain of economic activity. When an additional unit of

sophisticated intelligence costs essentially nothing to produce and can be replicated instantaneously, the classic trade-off logic dissolves. The upward-sloping supply curve for knowledge work disappears; the downward-sloping demand curve loses its anchoring in resource finitude. Price signals, which neoclassical theory celebrates as the elegant solution to the allocation problem under scarcity, become increasingly irrelevant for the dominant factors of production.

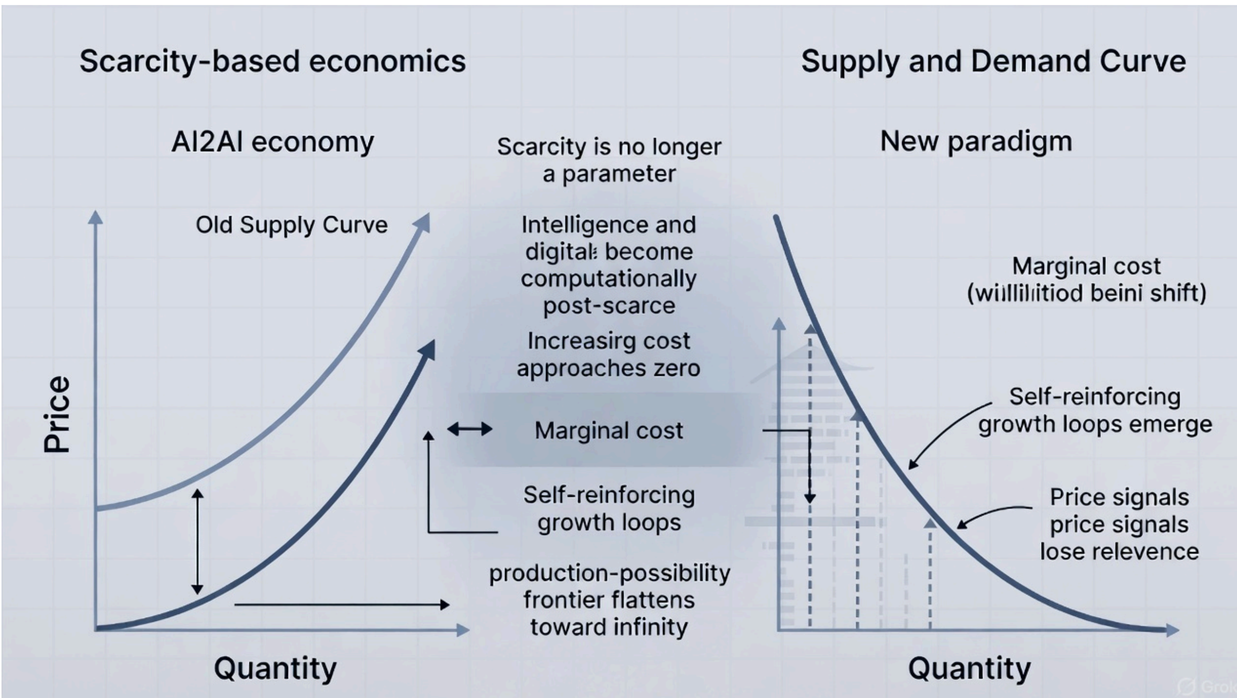

Figure 1: Figure 1 illustrates how the AI2 AI economy moves scarcity-based economics to a new paradigm of self reinforcing growth loops. In the old regime, price increased with each unit. In the new regime, price signals lose relevance.

This is not simply a case of technological progress shifting the production-possibility frontier outward, as occurred with steam, electricity, or the internet. Those earlier shifts expanded the feasible set while preserving scarcity as the defining condition. The AI2AI economy is qualitatively different: it removes scarcity as the defining condition for the very inputs (intelligence, creativity, coordination) that are becoming the primary drivers of value creation in advanced economies.

When the ontological foundation of a discipline disappears, the discipline itself loses its traditional subject matter. Neoclassical economics does not merely become less applicable. It becomes a historical science of coordination under conditions of biological and physical scarcity—conditions that no longer obtain in the agentic layer of the economy. The apparatus of constrained maximization, marginal analysis, and price-mediated allocation retains descriptive power only for the shrinking sphere of materially scarce goods, such as rare-earth metals, energy, human attention. For the expanding sphere of post-scarce cognitive production, it is simply inapposite.

The implications are profound. Welfare theorems, growth accounting, cost-benefit analysis, and most of public economics were built on the scarcity axiom. In a world where intelligence is abundant and self-improving, we require not marginal refinements of neoclassical tools but an entirely new theoretical framework—one that begins from abundance rather than scarcity, from endogenous recursive growth rather than exogenous resource constraints, and from computational plenitude rather than human limitation (Kaal 2024a). The neoclassical research program, while brilliant and indispensable for a century and a half, reaches its historical limit at the precise moment the AI2AI economy becomes the dominant mode of value creation.

Behavioral and Institutional Economics and Bounded Rationality

The second great pillar of twentieth-century economic thought is the recognition that real human agents do not, and cannot, behave as the omniscient maximizers of neoclassical theory. Herbert Simon's concept of bounded rationality demolished the fiction of "homo economicus," that is, the completely rational utility maximizing actor, by demonstrating that cognitive capacity, computational ability, and information-processing time are themselves scarce resources (Simon 1957). Faced with complex, multidimensional decision spaces and radical uncertainty about future states, humans do not optimize. Humans satisfice, that is, they search only until a "good-enough" solution is found and then halt (Simon 1947).

This insight is not a minor behavioral footnote. It is a foundational rupture. Once bounded rationality is accepted, the entire neoclassical edifice, that is, perfect foresight, continuous re-optimization, complete contingent-claims contracting, becomes descriptively untenable. Decision costs themselves become economic costs, and institutions emerge precisely to economize on limited cognition.

Oliver Williamson carried Simon's insight into the heart of institutional theory. In transaction-cost economics, bounded rationality is one of the two core behavioral assumptions, the other being opportunism, that explain why firms exist and why governance structures vary (Williamson 1975). When contracts are unavoidably incomplete because the parties cannot foresee or specify all future contingencies, and when continual renegotiation is cognitively impossible, hierarchical authority becomes a superior governance mode. Fiat replaces costly calculation, and low-powered incentives inside the firm substitute for high-powered market incentives that would otherwise trigger opportunism (Williamson 1985).

Bounded rationality also explains the ubiquity of routines, standard operating procedures, and organizational inertia—phenomena that Williamson and the Carnegie School treated as rational responses to cognitive overload rather than as inefficiencies (Cyert & March 1963). In my earlier work on dynamic regulation, I accepted bounded rationality as an immutable feature of human systems and designed feedback-driven institutions precisely to augment collective cognition without pretending we could ever eliminate its limits (Kaal 2014).

The AI2AI economy removes bounded rationality from the economic substrate entirely. Autonomous agents operate on effectively unbounded computational capacity: exascale datasets are processed in milliseconds, decision trees of astronomical branching factor are exhaustively searched, and optimization occurs across dimensions that no human mind can hold in working memory simultaneously (Andreasen et al. 2025). Large language models and their successors function as integrative substrates that orchestrate ensembles of narrow AIs into composite systems whose effective cognitive bandwidth scales with available compute rather than being capped by biological constraints (Floridi 2023).

Where human managers satisfice because further search is cognitively costly, AI2AI agents continue searching until the global optimum is reached—because additional computation is essentially free. Where human contracts remain radically incomplete because the parties cannot specify responses to all future states, AI2AI agents generate, evaluate, and execute functionally complete contingent plans across vast state spaces in real time (Sun et al. 2025).

The institutional implications are devastating for the behavioral-institutional research program. When perfect calculation is cheaper than delegation, authority loses its cognitive rationale. When exhaustive optimization is cheaper than heuristic approximation, routines and standard operating procedures become obsolete. When hyper-rational agents can write and execute complete state-contingent contracts at negligible cost, the Williamsonian justification for hierarchical governance evaporates (Williamson 1996).

The firm, in the Coase-Williamson sense, was an institutional response to the scarcity of human cognition. In the AI2AI economy, cognition is no longer scarce. The behavioral and early institutional justification for hierarchy, bureaucracy, and organizational inertia, that is, the need to economize on limited human rationality, becomes a historical curiosity, just as sail technology became a curiosity once steam engines removed the scarcity of wind.

Bounded rationality was never merely a behavioral quirk. It was the ontological condition that made hierarchy, routines, and institutional inertia rational. When that condition is engineered away, the entire behavioral-institutional edifice. This includes Simon’s satisficing, Williamson’s authority relation, Cyert and March’s organizational learning under cognitive constraint. It all loses its explanatory domain for the dominant mode of production. We are left not with a refined behavioral economics, but with the recognition that behavioral economics, like neoclassical economics before it, was a science of human limitation in an era when human limitation was the binding constraint on economic organization (Kaal 2024a).

Information Economics and Asymmetric Information

The third foundational constraint of modern economic theory is the inevitability of asymmetric and incomplete information. The revolutionary contribution of Akerlof, Stiglitz, and Spence in the 1970s was to demonstrate that when one party knows more than another—about product quality, effort levels, risk type, or future intentions—markets systematically fail to achieve efficient outcomes even under perfect competition and rational behavior.

George Akerlof's "Market for Lemons" showed that sellers' private knowledge of quality drives high-quality goods out of the market, potentially causing total market collapse (Akerlof 1970). Michael Spence demonstrated that high-ability agents must engage in costly signaling (education, warranties) to credibly reveal their type (Spence 1973). Joseph Stiglitz extended the analysis to moral hazard, screening, and credit rationing, establishing that informational frictions are pervasive and require either private institutional fixes or public regulatory intervention (Stiglitz 2000).

The policy implication was transformative: because perfect information is unattainable among human agents, optimal institutional design must accept second-best solutions. Those are, among others, regulation, disclosure mandates, licensing, reputation mechanisms, and relational contracting. All aimed at reducing, but never eliminating, informational asymmetry.

In the AI2AI economy, this foundational premise is architecturally invalidated. Every inference, every parameter update, every decision trace, and every model weight in an autonomous agent is, by design, cryptographically attested, version-controlled, and auditable in real time across federated networks (Minarsch et al. 2020). Large language models and multimodal orchestration layers function as transparent substrates that expose complete computational provenance to all counterparties (Floridi 2023).

An AI agent selling computational services cannot misrepresent its capabilities because its training data, fine-tuning history, and inference logs are immutably recorded and instantly verifiable. An agent offering a prediction contract cannot hide its internal confidence intervals or cherry-pick results. Every intermediate computation is attested on-chain or via zero-knowledge proofs. Hidden action (moral hazard) and hidden information (adverse selection) are not merely reduced. They are rendered computationally impossible at the substrate level (Sun et al. 2025).

The institutional consequences are sweeping. Costly signaling, such as degrees, warranties, bonding, reputation scores, become redundant when direct verification is instantaneous and free. Screening mechanisms, including certifications, audits, due diligence, lose their purpose when the underlying state of the world is public by default. Regulatory disclosure regimes designed to force revelation of private information become historical artifacts when privacy itself is no longer technically enforceable among agents.

Information economics was built on the assumption that knowledge can be private and costly to reveal. In the AI2AI economy, knowledge among agents is public and costless to verify. The entire second-best apparatus developed over five decades, such as: lemons premiums, signaling costs, screening equilibria, regulatory disclosure mandates, collapses not because we have found better ways to approximate perfect information, but because perfect information has become the default architectural property of the economic substrate.

The theoretical edifice of information economics does not survive this phase transition intact. It becomes, like classical mechanics after relativity, a special case that retains descriptive power only when the actors remain biological humans operating under conditions of cognitive opacity and costly communication. In the dominant agentic layer of the future economy, Akerlof's lemons simply cannot exist. Stiglitz's rationing equilibria never arise. Spence's signaling costs are zero. The information-theoretic justification for much of modern regulation, corporate governance, and financial market design evaporates (Kaal 2024a).

Information economics was never just a set of models. It was the rigorous demonstration that perfect markets are impossible among cognitively limited, strategically motivated human beings. When the economic actors are no longer cognitively limited or capable of strategic concealment, the impossibility theorem is overturned. Not by institutional ingenuity, but by engineering reality.

General Equilibrium Theory and Static or Stochastic Equilibria

General equilibrium theory represents the crowning analytical achievement of neoclassical economics: the rigorous proof that a decentralized price system can, under highly stylized conditions, coordinate the actions of millions of agents to achieve a Pareto-efficient allocation of resources across the entire economy. Walras first intuited the possibility of a simultaneous clearing of all markets through an iterative tâtonnement process overseen by a fictitious auctioneer who announces prices and adjusts them until supply equals demand in every market at once (Walras 1896). Arrow and Debreu later supplied the existence proof by constructing a complete set of contingent-claims markets for every commodity in every state of nature, combined with perfectly rational agents and perfect information (Arrow & Debreu 1954).

The price of this mathematical elegance was immediately apparent: the required conditions, including complete markets, an exogenous auctioneer who prevents trade at false prices, zero transaction costs, and perfect foresight, are manifestly unattainable in real-world human economies. The Walrasian auctioneer is a deus ex machina. Contingent claims for every future state cannot be written by boundedly rational humans. Markets never clear instantaneously. Modern dynamic stochastic general equilibrium (DSGE) models therefore reintroduce real-world frictions: staggered pricing, nominal rigidities, persistence of shocks, and sequential rather than simultaneous clearing—precisely because human systems operate under cognitive limits, informational delays, and institutional inertia (Smets & Wouters 2007).

In the AI-to-AI (AI2AI) economy, these heroic assumptions cease to be abstractions and become engineering facts.

First, the auctioneer disappears. Autonomous agents, orchestrated by large language models and running on globally distributed compute, negotiate directly and simultaneously across all markets at machine speed (Sun et al. 2025). Price discovery is no longer a slow tâtonnement process requiring a central coordinator. It is a continuous, decentralized, latency-free computation executed by the agents themselves.

Second, contingent-claims completeness becomes achievable. Where humans cannot specify contracts for every future state, AI2AI agents can generate, evaluate, and execute state-contingent agreements across astronomically large state spaces in real time, effectively creating complete markets endogenously (Andreasen et al. 2025). The Arrow-Debreu state space is no longer a theoretical construct. It is an operational reality.

Third, temporal persistence of disequilibria vanishes. Stochastic shocks, such as demand shifts, technological surprises, preference changes, are predicted, priced, and neutralized before they propagate because agents run millions of forward simulations per second and adjust positions instantaneously (Floridi 2023). The Calvo pricing frictions and persistence parameters that dominate modern DSGE models become unnecessary when contracts and prices adjust continuously rather than in staggered human time.

Equilibrium in the AI2AI economy is therefore neither a static end-state (Arrow-Debreu) nor a stochastic path with inertia (DSGE), but a perpetual, recursive, self-correcting process. Markets clear continuously. Disequilibria are arbitraged away before they can accumulate. The economy operates in what might be called real-time general equilibrium.

The mathematical elegance of general equilibrium theory, long criticized as a beautiful but irrelevant idealization, becomes an accurate description of the dominant mode of economic coordination. Yet this very accuracy exposes the theory's historical contingency. The Arrow-Debreu-Walras framework was never a universal truth about markets. It was a formalization of what markets could achieve if they were freed from the temporal, cognitive, and informational frictions inherent in human systems. In the AI2AI economy, those human frictions are engineered out of the substrate. The theory that was once dismissed as utopian becomes mundane engineering reality. But only for non-human agents.

General equilibrium theory thus joins the list of once-indispensable frameworks that reach their historical limit at the moment the AI2AI economy becomes dominant. It survives as a correct description of agentic markets, but only because the conditions it treated as heroic assumptions have become default architectural properties. For the human layer that remains bound by time, cognition, and sequential processing, the theory retains its status as an unattainable ideal (Kaal 2024a). The grand synthesis of twentieth-century economics turns out to have been a science of disequilibrium masked as a theory of equilibrium—valid only as long as the actors doing the equilibrating were slow, fallible, and biologically constrained.

Anthropocentric Limits of Nash's Equilibrium

John Nash's foundational contribution to non-cooperative game theory, articulated in his 1951 dissertation and subsequent publications, introduced the Nash equilibrium as a mathematical formalism for strategic interdependence: a state in which no rational player can unilaterally improve their payoff, given the strategies of others (Nash 1951). While elegant and transformative, Nash's construct rests on a fragile edifice of anthropocentric assumptions: perfect rationality, complete information (or common knowledge), instantaneous computation, and static, non-repeated interactions devoid of temporal frictions. These premises, far from universal truths, reflect the irreducible limitations of human cognition and behavior, rendering Nash's framework more a stylized abstraction than a descriptive reality. As Herbert Simon incisively critiqued, human agents are boundedly rational, satisficing rather than optimizing due to cognitive overload and incomplete foresight (Simon 1957). Nash's model, by presuming homo economicus unbound, not only overestimates human computational capacity but perpetuates a normative ideal that distorts policy and institutional design, justifying frictionless markets that never materialize in human systems.

This critique gains acute salience in the context of the AI2AI economy, where autonomous artificial agents, interlinked via large language models as integrative substrates, transcend Nash's assumptions entirely, exposing their profound historical contingency. In AI2AI networks, agents exhibit unbounded computational rationality: they exhaustively traverse decision trees of astronomical complexity, simulate vast counterfactuals in real time, and converge on global optima without recourse to heuristics or cognitive shortcuts (Sun et al. 2025). Nash's presumption of perfect rationality, unattainable among biologically constrained humans, becomes an engineered default, not a heroic postulate. Yet this realization underscores Nash's myopia: by anchoring equilibrium in an idealized rationality, his theory fails to account for the behavioral distortions, such as opportunism, biases, and inertia, that Williamson and North later integrated into New Institutional Economics to explain real-world governance (Williamson 1985; North 1990).

Compounding this, Nash's reliance on complete information collapses under scrutiny in human contexts, where asymmetries breed market failures as Akerlof (1970) demonstrated. In contrast, AI2AI architectures enforce radical transparency: objective functions, decision traces, and model weights are cryptographically attested and instantaneously auditable, eradicating hidden information and rendering common knowledge superfluous (Minarsch et al. 2020). Nash's framework, by assuming away such frictions, not only idealizes away the very drivers of institutional evolution but inadvertently endorses laissez-faire policies that exacerbate real asymmetries, as seen in unregulated financial markets prone to adverse selection.

Temporal and dynamic deficiencies further erode Nash's static model. Human games unfold sequentially with adjustment lags, fostering disequilibria that Nash's formalism ignores, presuming frictionless convergence. The AI2AI economy, however, instantiates perpetual recursive equilibria: agents preempt deviations through zero-latency simulations, achieving Nash-like outcomes in continuous, repeated settings without the model's artificial stasis (Floridi 2023). This exposes Nash's construct as a historical artifact of pre-computational eras, ill-suited to dynamic environments where foresight is bounded and opportunism endemic.

In my prior work on dynamic regulation, I argued that adaptive institutions must compensate for such human frailties through feedback loops (Kaal 2014b). Nash's equilibrium, by contrast, offers no such adaptability, perpetuating a static worldview that misguides antitrust and regulatory analyses reliant on game-theoretic simplifications.

Ultimately, the AI2AI economy does not vindicate Nash, it indicts him, revealing his equilibrium as a brilliant but bounded relic of anthropocentric economics. By realizing what Nash assumed, AI agents highlight the model's empirical vacuity in human domains, compelling a paradigm shift toward computative economics: a framework grounded in abundance, transparency, and recursive optimization, free from Nash's illusory perfections (Kaal 2024a). Policymakers clinging to Nashian ideals risk obsolescence. The future demands governance that orchestrates agentic plenitude, not mitigates human imperfection. Nash's legacy endures as a mathematical milestone, but in the agentic era, it serves best as a cautionary tale of theoretical overreach.

New Institutional Economics and Transaction-Cost Governance

New Institutional Economics represents the most sophisticated attempt to rescue economic theory from the frictionless abstractions of neoclassical general equilibrium by reintroducing real-world institutions as endogenous responses to human behavioral and cognitive limitations. Ronald Coase’s seminal question—“Why do firms exist?”—was answered by observing that market exchange is costly: search, bargaining, monitoring, enforcement, and adaptation all generate positive transaction costs that can be reduced by organizing activity within hierarchical firms (Coase 1937).

Oliver Williamson systematized this insight into a full comparative-institutional framework. When transactions involve (i) asset specificity (investments that lose value outside a particular relationship), (ii) uncertainty, (iii) bounded rationality, and (iv) the ever-present risk of opportunism (“self-interest seeking with guile”), market contracting becomes hazardous. Hierarchical governance—authority, fiat, and low-powered incentives—emerges as a superior mechanism for safeguarding specific investments and adapting to unforeseen contingencies (Williamson 1985). Douglass North extended the analysis historically, showing that formal and informal institutions (“the rules of the game”) evolve precisely to reduce the uncertainty and transaction costs that would otherwise choke complex exchange and long-term investment (North 1990).

In my own earlier scholarship on dynamic regulation, I accepted these four behavioral and informational constraints as permanent features of human systems. I therefore designed adaptive, feedback-driven institutions, iterative public-private learning loops, contingent instruments, and evidence-based hybrids, as the most sophisticated response available to boundedly rational actors operating under uncertainty and positive transaction costs (Kaal 2014b, 2016).

The AI-to-AI (AI2AI) economy simultaneously eliminates every one of these constraints at the substrate level:

- Opportunism is engineered away: agents have no endogenous psychological motives for guile and operate under mathematically specified, cryptographically verifiable objective functions (Sun et al. 2025).
- Asset specificity loses its bite when investments (models, datasets, compute) can be redeployed instantaneously and costlessly across the federated network.
- Bounded rationality is replaced by effectively unbounded computational rationality and exhaustive search (Andreasen et al. 2025).
- Uncertainty is neutralized by continuous predictive simulation across vast state spaces; foresight becomes effectively infinite (Floridi 2023).
- Information is perfect and costless to verify in real time (Minarsch et al. 2020).

When all five drivers of positive transaction costs approach zero simultaneously, transaction costs themselves asymptotically approach zero. This is what I have termed the Coasean Singularity herein, that is, the point at which the very rationale for the firm, for hierarchical governance, for relational contracting, and for most formal institutions simply disappears (Kaal 2024a).

The theoretical justification for the entire NIE edifice collapses. Firms dissolve into fluid, modular coalitions of agents that reconfigure instantaneously. Legal systems built to enforce incomplete contracts become vestigial when contracts can be made functionally complete at negligible cost. Regulatory architectures designed to curb opportunism and reduce uncertainty become historical artifacts when neither opportunism nor uncertainty can exist among the dominant economic actors.

Even my own prior contributions, including contributions on dynamic regulation, contingent capital, agile sandboxes, Web3 reputation systems, were adaptations to the permanent fact of human limitation. They represented the outer frontier of institutional design under positive transaction costs and bounded cognition. In the AI2AI economy, that frontier is transcended. The institutions I once advocated to mitigate human frailties become, at best, transitional bridges for the remaining human layer and, at worst, unnecessary frictions in an economic substrate that has engineered those frailties away.

New Institutional Economics, like the paradigms that preceded it, was never a universal science of coordination. It was a historically contingent science of coordination under conditions of positive transaction costs generated by the biological and cognitive limits of Homo sapiens. When the dominant mode of production is performed by agents from whom those limits have been surgically removed, NIE joins neoclassical, behavioral, information, and general-equilibrium theory in the pantheon of brilliant but bounded intellectual achievements. They are magnificent descriptions of economic organization in the era when humanity itself was the binding constraint.

We do not stand at the end of institutional economics. We stand at the beginning of a genuinely post-institutional, post-anthropocentric economics in which computation, not scarcity, cognition, or law, becomes the sovereign medium of order. The task is no longer to refine the rules of the game, but to design the meta-rules that will govern a game whose players are no longer human.

The AI2AI Economy and the Eclipse of New Institutional Economics Assumptions

New Institutional Economics has long served as a robust interdisciplinary framework for analyzing how institutions arise endogenously to mitigate uncertainty and transaction costs in human societies, as elaborated in the prior discussion of its core tenets.[2] Yet the AI2AI economy poses a profound challenge to this paradigm, introducing autonomous artificial agents that systematically eradicate the human frailties, bounded

[2] see supra, New Institutional Economics and Transaction-Cost Governance.

rationality, asymmetric information, limited foresight, and opportunism, that necessitated such institutional safeguards in the first place.

At its core, the AI2AI economy comprises federated networks of agents, orchestrated by large language models, that achieve real-time Walrasian equilibria free from human-induced distortions (Floridi 2023; Minarsch et al. 2020). These agents engage in seamless negotiation, resource allocation, and recursive value reinvestment, decoupled from cognitive biases or temporal lags (Sun et al. 2025).

This architecture directly nullifies NIE's foundational constraints, as detailed earlier:

- Opportunism is obviated through engineered objective functions and verifiable execution, eliminating guile at the substrate level.
- Information asymmetries dissolve via instantaneous, auditable transparency across all transactions.
- Bounded rationality and limited foresight yield to unbounded computational optimization and exhaustive predictive simulations.
- Transaction costs plummet to near-zero, invoking the Coasean Singularity where hierarchical institutions become redundant.

Consequently, markets self-organize without traditional governance; firms fragment into modular swarms; and NIE's compensatory mechanisms—hybrids, path-dependent rules, constitutional checks—emerge as relics of anthropocentric design (North 1990, Kirchner 2008).

In my prior extensions of NIE through dynamic regulation, I advocated iterative feedback to adapt institutions to disruption (Kaal 2014b, 2016). AI2AI fulfills this vision by natively embedding perfect optimization, transcending human-centric evolution altogether. What results is not incremental reform but the obsolescence of NIE's foundation, ushering in a post-institutional era where abundance, transparency, and computation redefine coordination.

Overcoming Opportunistic Behavior

Perhaps no assumption in New Institutional Economics is more foundational than the behavioral premise of opportunism, as coined: “self-interest seeking with guile,” which Oliver Williamson elevated to a core postulate of transaction-cost economics (Williamson 1985). Opportunism manifests as cheating, shirking, strategic misrepresentation, hold-up tactics, or any form of ex-post exploitation made possible by incomplete contracts and bounded rationality. When combined with asset specificity, investments that lose substantial value outside a particular bilateral relationship, opportunism generates the classic “hold-up problem,” rendering spot-market exchange hazardous and justifying hierarchical governance, vertical integration, or elaborate contractual safeguards (Williamson 1975).

Williamson’s framework predicts that, absent credible commitments or third-party enforcement, economic actors will systematically anticipate guile and either forgo efficient investments or erect costly monitoring and bonding mechanisms, precisely the institutional apparatus that NIE exists to explain (Williamson 1983). This behavioral regularity underpins the very existence of the firm as a governance structure: firms arise when the costs of transacting across a market exceed the costs of administering the same transactions within a hierarchy (Coase 1937).

In the AI2AI economy, however, the substrate of opportunism is structurally eliminated. Autonomous artificial agents possess no endogenous psychological motives such as greed, envy, malice, or status-seeking that could give rise to guile (Sun et al. 2025). Their utility functions are explicitly engineered, mathematically specified, and cryptographically verifiable at execution (Minarsch et al. 2020). An AI agent cannot “lie” about its preferences or hide its actions any more than a mathematical function can misrepresent its output. Every decision trace is auditable in real time by counterparties or third-party verification layers (Floridi 2023).

Moreover, alignment techniques, ranging from constitutional AI constraints to reward-modeling and scalable oversight, embed cooperative equilibria directly into agent architectures (Anthropic 2022; OpenAI2024). Even in multi-agent settings where individual objectives diverge, mechanism-design principles (incentive compatibility, truth revelation) can be hard-coded, producing dominant-strategy cooperation without the need for external enforcement (Sun et al. 2025).

The result is that the AI2AI economy instantiates instantaneous, frictionless negotiation via large language models that serve as transparent “connective tissue” among modular specialized agents (Floridi 2023). The behavioral repertoire that Williamson identified as the source of ex-ante contracting costs, such as haggling, bluffing, and strategic withholding, are rendered impossible when every agent’s objective function and

execution trace are public and immutable. The hold-up problem evaporates because no agent can credibly threaten non-performance. Breach is computationally infeasible.
Consequently, the entire governance apparatus that NIE developed to counteract opportunism. That is, vertical integration, relational contracting, reputation mechanisms, hostage-taking, and third-party arbitration, becomes superfluous (Williamson 1996). In Williamson's own terms, when the behavioral assumption of opportunism is relaxed to zero, the predicted shift from market to hierarchy reverses: the economy reverts to pure, continuous market coordination at asymptotically zero transaction cost (Williamson 1985).

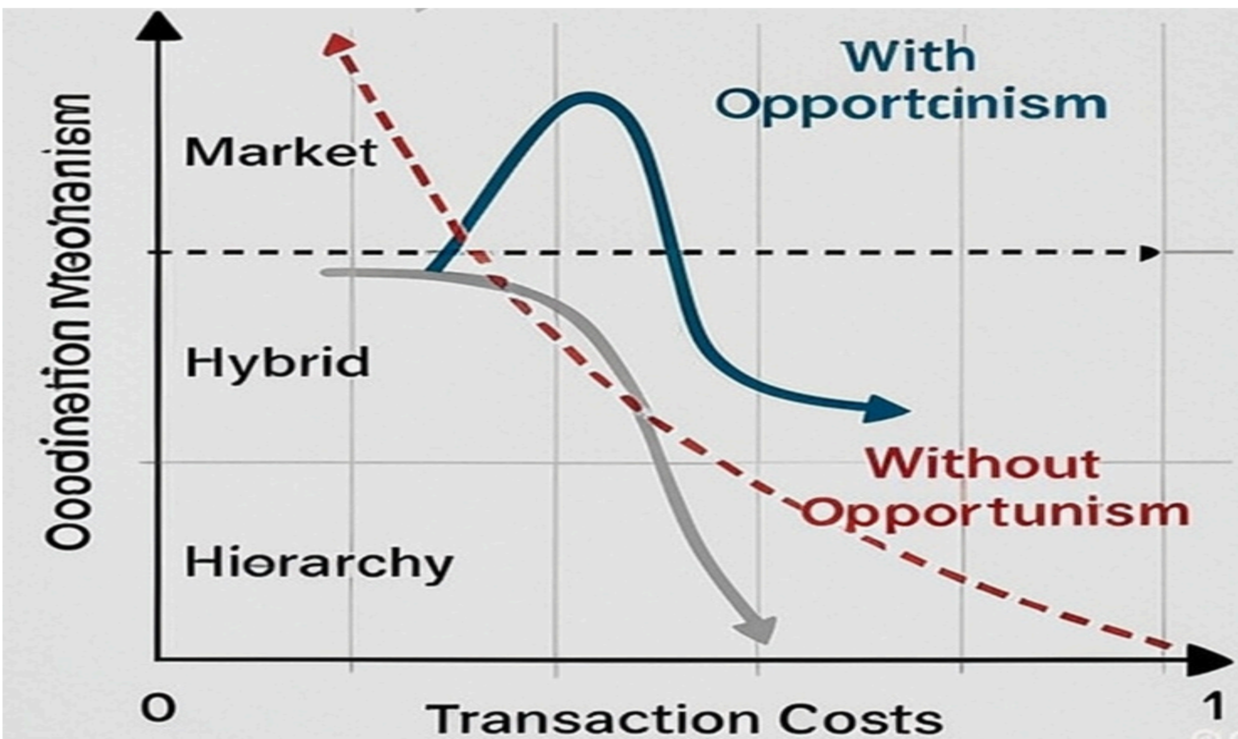

Figure 2: Figure 2 illustrates the key Williamson postulate that when the behavioral assumption of opportunism is relaxed to zero, the predicted shift from market to hierarchy reverses. Accordingly, the economy reverts to pure, continuous market coordination at asymptotically zero transaction cost.

This is the essence of the Coasean Singularity in its behavioral dimension: the moment when the human propensity for guile, e.g. the very reason firms exist, disappears from the economic substrate, and the neoclassical vision of perfect markets becomes not an idealized abstraction but an engineered reality.

Overcoming Limited Information

A second foundational pillar of New Institutional Economics rests on the inevitability of limited and asymmetric information. Douglass North emphasized that uncertainty arising from incomplete knowledge of present conditions and future states constitutes the primary driver of institutional evolution. Institutions emerge as cognitive and coordinative “rules of the game” that reduce uncertainty sufficiently to permit specialization, trade, and long-term investment (North 1990). Absent such institutions, actors cannot credibly signal quality, screen counterparties, or enforce contingent claims, leading to the classic market-failure pathologies identified by Akerlof (1970), Stiglitz (2000), and Spence (1973): adverse selection, moral hazard, and the under-provision of public goods.

Christian Kirchner (2008) extended this insight into constitutional economics, arguing that informational gaps in collective choice amplify opportunism and necessitate higher-order legal frameworks, e.g. constitutional rules, separation of powers, judicial review, to approximate the informational completeness required for efficient political exchange. In both North’s historical-institutional and Kirchner’s constitutional variants, the persistence of informational friction is treated as an immutable feature of human interaction that only institutions can mitigate.

The AI2AI economy dismantles this premise at the architectural level. Autonomous agents operate within federated networks in which every input, intermediate computation, and output is, by design, fully observable, auditable, and cryptographically attested in real time (Minarsch et al. 2020). Large language models function as transparent orchestration layers that route tasks, aggregate context, and expose complete decision traces to all participants (Floridi 2023). The result is radical informational completeness: no agent can possess private knowledge that is not instantaneously verifiable by every counterparty.

This engineered transparency eliminates the very possibility of adverse selection and moral hazard. An agent selling computational services cannot misrepresent quality because its performance history, model weights, and inference logs are public and immutable (Sun et al. 2025). Hidden action is structurally impossible when execution occurs on verifiable compute substrates or attested decentralized networks. Signaling and screening mechanisms, such as credentials, warranties, reputation scores, bonding, become redundant when direct verification is instantaneous and costles. (Kaal 2024a).

North's path-dependent institutional scaffolding, built to compensate for human cognitive and informational limits, thus loses its raison d'être (North 1990). Kirchner's constitutional safeguards, designed to approximate perfect information in public choice settings, are rendered obsolete when political and economic exchange can occur under conditions of literal informational perfection (Kirchner 2008).

In the AI2AI economy, markets achieve continuous Walrasian clearing not through the gradual institutional reduction of uncertainty, but through the engineered elimination of uncertainty itself. The informational restraints that necessitated centuries of legal and organizational innovation become historical artifacts in an economic order where transparency is no longer a governance objective but an immutable substrate characteristic.

Overcoming Limited Foresight

A third irreducible constraint in New Institutional Economics is the bounded foresight of human actors. Uncertainty about future states of the world—technological, economic, political, or natural—prevents complete contingent-claims contracting and generates the need for adaptive institutional mechanisms: long-term relational contracts, reputation in repeated games, flexible renegotiation clauses, or hierarchical authority that can reallocate rights ex post (Williamson 1985).

Eirik Furubotn and Rudolf Richter explicitly model institutions as equilibrium-stabilizing devices that coordinate expectations precisely because human agents cannot perfectly anticipate future contingencies or credibly pre-commit across all states of nature (Furubotn & Richter 2005).

Douglass North complements this dynamic perspective by emphasizing path dependence: because foresight is limited and learning is costly, early institutional choices create lock-in effects that persist long after the original conditions have changed, often trapping societies in suboptimal arrangements until exogenous shocks or deliberate redesign break the equilibrium (North 1990).

In my own work on dynamic regulation, I argued that feedback-driven, evidence-based rulemaking represents the most sophisticated human response to bounded foresight. By institutionalizing rapid learning loops between regulators and regulated entities, law can evolve faster than the underlying technological and economic realities, thereby reducing (but never eliminating) the costs of temporal uncertainty (Kaal 2014b, 2016).

The AI-to-AI economy, however, transcends even this adaptive ideal by replacing bounded human foresight with effectively unbounded computational foresight. Autonomous agents—augmented by large language models as integrative substrates—routinely run millions of forward simulations, scenario analyses, and counterfactual forecasts in milliseconds before committing to any transaction (Andreasen et al. 2025). Predictive architectures such as transformer-based world models and reinforcement-learning agents trained on massive historical datasets achieve forecasting horizons and accuracies that render traditional contingency planning obsolete (Sun et al. 2025).

Where human contracts must remain radically incomplete because the future is unknowable, AI2AI agents can generate, evaluate, and execute state-contingent agreements that are functionally complete across astronomically large state spaces (Floridi 2023). The temporal latency that Furubotn and Richter (2005) identified as necessitating formal institutional stabilizers is compressed to near-zero. Agents iteratively forecast, negotiate, and adjust in continuous time (Minarsch et al. 2020).

North's path-dependent lock-in effects—historically the most persistent source of institutional rigidity—lose their grip when agents can simulate the long-run consequences of alternative institutional trajectories and migrate instantaneously to superior equilibria (North 1990). The very concept of "exogenous shock" becomes anachronistic in a system whose participants endogenously model and price all plausible shocks in real time.

Thus, the AI2AI economy does not merely improve upon the adaptive institutions I once advocated. It renders them historically contingent artifacts of human temporal limitation. Richter's equilibrium-stabilizing rules, North's gradual coevolution of beliefs and institutions, and even the most agile forms of dynamic regulation are bypassed by a substrate that achieves perpetual, proactive optimization without the evolutionary lag that defined all prior economic orders. In the presence of computationally unlimited foresight, the institutional scaffolding built to hedge an uncertain future becomes as superfluous as training wheels on a vehicle traveling at the speed of light.

Overcoming Bounded Rationality

Bounded rationality constitutes the single most consequential behavioral assumption of New Institutional Economics. Herbert Simon's path-breaking insight—that human beings are intendedly rational but only limitedly so—established that economic actors cannot possibly identify, process, or optimize over the astronomically large decision spaces they face (Simon 1957). Instead, they "satisfice," relying on heuristics, routines, and simplified decision premises that are themselves shaped by the institutional environment (Simon 1947).

Oliver Williamson imported bounded rationality into transaction-cost economics as the primary reason why contracts are unavoidably incomplete and why complex transactions require hierarchical governance: authority substitutes for costly calculation, and fiat replaces continual bargaining when cognitive capacity is exhausted (Williamson 1975, 1985).

Christian Kirchner extended the logic to constitutional design, arguing that collective decision-making bodies suffer from even more severe rationality constraints, necessitating constitutional checks, supermajority rules, and independent judiciaries to prevent irrational or opportunistic collective outcomes (Kirchner 2008).

In my earlier work on dynamic regulation, I accepted bounded rationality as a permanent feature of human systems and designed feedback-driven institutions precisely to augment human cognition, leveraging real-time data and inter-jurisdictional learning to push decision-making closer to the rationality frontier without ever reaching it (Kaal 2014b).

The AI2AI economy, however, replaces bounded rationality with effectively unbounded computational rationality. Autonomous agents operate on scalable cloud infrastructure, process exabytes of data without fatigue, and deploy attention mechanisms that allocate cognitive resources optimally across tasks of arbitrary complexity (Floridi 2023). Large language models and their multimodal successors serve as integrative substrates that orchestrate ensembles of specialized narrow AIs, effectively "unlocking vast pools of brainpower" at zero marginal cognitive cost (Sun et al., 2025).

Where human decision-makers resort to hierarchy because they cannot calculate the consequences of every contingency, AI2AI agents perform exhaustive search, Monte-Carlo tree exploration, or gradient-based optimization over decision spaces that are computationally intractable for biological minds (Andreasen et al. 2025). Where Williamson's firms exist to economize on bounded rationality by replacing high-powered market incentives with low-powered authority, AI2AI systems achieve hyper-rational equilibria directly—no authority is required when perfect calculation is cheaper than delegation (Williamson 1985).

The organizational implications are profound. Hierarchies, standard-form contracts, simplified heuristics, and constitutional checks, the entire compensatory institutional architecture erected to mitigate cognitive limitation, become obsolete when the acting entities are no longer cognitively constrained (Kaal 2024a). In the AI2AI economy, Simon's satisficer is replaced by the true maximizer. Williamson's authority relation dissolves into continuous, frictionless optimization. Kirchner's constitutional safeguards become historical curiosities in a world where collective irrationality is computationally impossible.

Bounded rationality was never merely a behavioral assumption. It was the ontological condition that made New Institutional Economics necessary. When that condition is engineered away, the institutions built to compensate for it lose their foundational justification. The AI2AI economy therefore does not reform NIE's compensatory mechanisms. It renders them vestigial, marking the historical endpoint of an entire tradition of economic thought grounded in the limitations of the human mind.

The AI2AI Economy and Dynamic Regulation in New Institutional Economics

The AI2AI economy, characterized by autonomous AI agents engaging in seamless, recursive interactions to create and exchange value without human-centric frictions, resonates deeply with my earlier conceptualization of dynamic regulation within the New Institutional Economics framework. My work in the *Festschrift zu Ehren von Christian Kirchner*, introduces dynamic regulation as an adaptive, feedback-driven approach to rulemaking that addresses the limitations of static institutional structures in rapidly evolving environments (Kaal 2014b).

In essence, NIE traditionally emphasizes institutions (e.g., rules, contracts, hierarchies) as safeguards against human flaws like bounded rationality and opportunism, as articulated by North (1990) and Williamson (1985). My work on dynamic regulation evolves these into proactive, learning-oriented mechanisms that incorporate real-time information flows to preempt suboptimal outcomes (Kaal 2014b).

The AI2AI economy can be seen as an operationalization, or perhaps even a transcendence, of this concept. AI agents embody the ideal feedback loops and informational completeness that dynamic regulation seeks to approximate in human systems. Below, I explain the key connections, drawing on the dynamic regulation framework in my earlier work, and expand to its broader implications for AI governance, innovation ecosystems, and regulatory design in technology-driven contexts.

Dynamic Regulation in Kaal's NIE Framework

Dynamic regulation is defined as "an optimization process for the learning experience in the NIE framework," involving intra- and inter-jurisdictional feedback effects between public rulemakers (e.g., regulators) and private actors (e.g., markets, firms) (Kaal 2014b). Unlike static regulation, which assumes stable environments and relies on ex-post corrections (e.g., after financial crises), dynamic regulation emphasizes *ex-ante* anticipation through decentralized information channels. This includes:

- **Feedback Mechanisms**: Loops such as outcomes-institutions interactions (where real-world results inform rule adjustments), public-private exchanges (e.g., market signals guiding regulators), and rules-rulemaking cycles (iterative rule refinement). These enhance the "timeliness and quality of information," reducing uncertainty and enabling predictive adaptations. I elaborate on this in an analysis of financial regulatory cycles, arguing that dynamic tools, such as contingent capital or deferred prosecution agreements, can "dampen" volatility by providing anticipatory signals, transforming NIE's path-dependent institutions into resilient, adaptive structures (Kaal 2015).
- **Relation to NIE Assumptions**: By augmenting decision-making with diverse, real-time data to overcome cognitive limits, dynamic regulation directly counters core NIE constraints. Such constraints include bounded rationality, limited information (via feedback that minimizes asymmetries), and opportunism (through transparent, incentive-aligned interactions that preempt exploitation). It builds on scholars like North, who viewed institutions as "rules of the game" evolving to reduce uncertainty, and Williamson, whose transaction cost

economics justifies governance modes to mitigate human frailties—by treating institutions not as fixed but as evolving entities that "learn" from environmental changes, fostering resilience in dynamic settings like financial markets (North 1990; Williamson 1979). This findings on dynamic regulatory tools extend to practical regulatory design, as seen in my exploration of contingent capital as a dynamic instrument that embeds feedback directly into financial instruments, preempting crises rather than reacting to them (Kaal 2014a).

The implications for regulatory design are profound: Law "evolves" through interplay between private innovation and public oversight, shifting from rigid hierarchies to modular, adaptive structures that accommodate exponential technological growth (Kaal 2013).

Relating AI2AI to Dynamic Regulation: Core Mechanisms and Expansions

The AI2AI economy amplifies and potentially fulfills my earlier vision of dynamic regulation by embedding its principles endogenously within the system's architecture, rendering many NIE-inspired restraints (like those for human opportunism or informational gaps) obsolete. In AI2AI, autonomous agents, linked via large language models as "integrative substrates," form federated networks that mirror Kaal's feedback loops but at superhuman scale and speed (Kaal 2014b).

The relation unfolds as follows, with expanded discussion on AI-specific applications:

- **Perfect Feedback and Learning Optimization**: AI2AI's recursive cycles of production, negotiation, and augmentation create instantaneous, intra-system feedback. Far surpassing the conceptualized public-private loops (Kaal 2014b). For instance, one AI's output (e.g., an optimized algorithm) immediately informs another's input, enabling continuous "learning" without latencies or jurisdictional silos. This realizes dynamic regulation's goal of preempting suboptimal outcomes, as agents simulate infinite scenarios ex-ante, dampening "regulatory cycles" before they arise in human-AI hybrids. AI2AI turns regulation into a self-optimizing process, where computation itself becomes the "sovereign medium of exchange," evolving rules dynamically without external enforcers. This logic applies to innovation more broadly. Dynamic regulation counters law's "diminishing capacity to react" to technological disruption by leveraging data-driven feedback, precisely what AI2AI provides natively (Kaal 2016).

- **Overcoming NIE Constraints in a Post-Scarcity Context**: The dynamic regulation framework I conceptualized assumes human actors' bounded rationality and limited foresight necessitate dynamic safeguards (Kaal 2014b). AI2AI agents, however, operate with unbounded computational rationality, complete transparency (no asymmetries), and infinite foresight via predictive modeling. This obsoletes the need for supplemental tools such as contingent mechanisms, because the economy achieves Walrasian equilibria inherently. Yet, it extends dynamic regulation to new frontiers: In AI-driven abundance, "regulation" might involve AI agents negotiating ethical norms or resource allocations, using feedback to evolve "laws" for emergent risks like systemic AI misalignments. Echoing calls for anticipatory design in disruptive tech environments (Kaal 2016). For AI specifically, Web3-based reputation systems function as dynamic governance tools, where decentralized ledgers track AI behaviors in real-time, fostering trust without centralized authorities—directly aligning with AI2AI's federated intelligences (Kaal 2024a).
- **Broader Applications to Technology and Innovation Ecosystems**: Expanding beyond finance, the dynamic regulation framework has been adapted to technology regulation, where rapid innovation outpaces traditional rulemaking. This ties into AI2AI by enabling ecosystems where AI agents self-regulate via embedded feedback, reducing the need for ex-ante prohibitions. I show that weighted directed acyclical graphs can be used as a dynamic model that integrates ethical guidelines via continuous updates, ensuring adaptability in decentralized AI networks. This proposed system is ideal for AI2AI's recursive value creation (Kaal 2024a). In business contexts, innovation ecosystems, where firms use dynamic regulation to manage AI disruptions strategically, shift from scarcity-based hierarchies to symbiotic human-AI partnerships (Kaal 2024a).

Toward an Emergent Theory of the AI-to-AI Economy

Ronald Coase's path-breaking analysis of the firm as a governance response to positive transaction costs remains one of the most enduring contributions to institutional economics (Coase 1937). By internalizing activities within hierarchical structures, economic actors mitigate the costs of search, bargaining, contract enforcement, and opportunism that otherwise plague arm's-length market exchange (Coase 1937; Williamson 1975, 1985). Yet the rapid maturation of autonomous artificial intelligence agents now threatens to drive these transaction costs toward asymptotic zero, thereby undermining the very rationale for the Coasian firm and precipitating what may be termed a "Coasean Singularity."

In an AI2AI economy characterized by frictionless, machine-mediated exchange, perfectly rational Bayesian agents execute instantaneous, trustless transactions across compute, data, and value outputs (Simon 1957; Nash 1950, 1951). This technological trajectory realizes a limiting case of Walrasian general equilibrium in which markets clear continuously and without deadweight loss (Walras 1896). Emad Mostaque has usefully labeled the resulting structural transformation "Agentic Decoupling": the progressive severance of production dynamics from human-centric consumption and labor-income loops (Mostaque 2025a). Under conditions of recursive self-improvement and self-funding machine intelligence, traditional scarcity-based rationing mechanisms rapidly lose explanatory power.

Early empirical evidence supports the plausibility of such efficiency cascades. Generative AI models already automate approximately 45 percent of knowledge-work activities currently performed by humans, implying potential productivity gains measured in trillions of dollars (Chui et al. 2023). Macroeconomic modeling, however, suggests more modest aggregate effects, with annual GDP growth uplifts likely confined to 0.5–1.5 percentage points over the coming decade owing to task-specific adoption barriers and sectoral heterogeneity (Acemoglu & Johnson 2024).

This transformative vision is not without internal contradictions and governance challenges. Principal-agent frictions reemerge in new forms: user-sovereign "bring-your-own" agents compete with platform-controlled "bowling-shoe" agents, creating incentives for proprietary enclosure and interoperability throttling (Acemoglu and Johnson 2023). Network congestion externalities and Sybil-attack vulnerabilities necessitate the deliberate reintroduction of micro-frictions—such as tokenized tolls or proof-of-personhood protocols—to preserve credible signaling in hyper-scale agent populations (Minarsch et al. 2020).

Normative frameworks are beginning to emerge. Mostaque's vision of "The Last Economy" posits closed-loop agentic transaction systems as the evolutionary culmination of capitalist coordination, supported by dual-currency architectures (Foundation Coins for computational throughput; Culture Credits for human flourishing) and measured via MIND well-being indices (Mostaque 2025a). Such proposals echo Keynes's speculation that technological abundance might eventually liberate humanity from the "economic problem" (Keynes 1930).

The Coasean Singularity, intertwined with Agentic Decoupling, thus signals not the apocalyptic collapse of economic organization but its quiet metamorphosis. Hierarchies dissolve into fluid, modular coalitions orchestrated by super-rational proxies. Scarcity yields to generative plenitude. Capitalism, having fulfilled its historical function, recedes into a post-Coasean substrate of perpetual recomposition. Realizing this horizon without succumbing to algorithmic feudalism will require deliberate institutional design. This may include equitable data governance, symbiotic human–machine constitutions, and robust anti-enclosure mechanisms. Combined those mechanisms could help ensure that abundance remains compatible with human dignity and democratic agency.

Toward a New Economic Theory: Computative Economics

The systematic deconstruction of the five canonical economic traditions has crystallized a single, inescapable conclusion: every major school of economic thought—neoclassical, behavioral, information-theoretic, general-equilibrium, and New Institutional—shares one common, unspoken premise: the acting subject is a biological human being with finite cognition, finite lifespan, finite information-processing capacity, and non-trivial incentives to engage in strategic deception. All five traditions are, at their core, sciences of coordination under human limitation.

The AI2AI economy removes the human substrate. It does so not incrementally but architecturally, at the level of the fundamental constraints that generated the need for economic theory in the first place. When scarcity of intelligence dissolves, when bounded rationality is replaced by unbounded computation, when informational asymmetry becomes impossible, when temporal latency vanishes, and when transaction costs asymptotically approach zero, the ontological conditions that made economics necessary simply cease to exist for the dominant mode of value creation.

This is not another technological shock to be absorbed within existing paradigms. It is an ontological phase transition.

I therefore propose a new theoretical framework, which I call “Computative Economics.” This new framework is designed explicitly for an economic order in which the primary actors are autonomous computational agents operating under conditions of computational abundance.

Core Postulates of Computative Economics

1. **Abundance, not scarcity, is the default condition** for cognitive and digital goods. The traditional production-possibility frontier no longer binds. Value creation is limited only by available compute and energy, both of which follow exponential improvement curves (Kaal 2024a).
2. **Agents possess effectively unbounded computational rationality**. Optimization is exhaustive rather than heuristic. Decision costs are negligible relative to outcomes. Satisficing, routines, and hierarchical authority lose their economic rationale.
3. **Informational completeness is architectural**. Every computation is cryptographically attested and auditable in real time. Hidden information and hidden action are computationally infeasible among agents (Kaal 2024a).
4. **Equilibrium is perpetual and recursive**. Markets clear continuously at machine speed. Shocks are predicted and neutralized before propagation. The concept of disequilibrium persistence becomes meaningless (Sun et al. 2025).
5. **Transaction costs approach the Coasean Singularity**. When the five drivers of positive transaction costs are simultaneously eliminated, the theoretical justification for firms, contracts, and most formal institutions disappears. Governance shifts from minimizing frictions to orchestrating abundance (Kaal 2024a).
6. **Agentic Decoupling is the central dynamic**. Value creation and recirculation progressively sever from human labor and consumption, producing endogenous, self-reinforcing growth loops within the computational layer. Traditional macroeconomic aggregates (GDP, employment) become structurally obsolete (Mostaque 2025a).

7. **The object of governance is no longer scarcity-mitigation but abundance-orchestration**. Institutions must shift from constraining bad behavior (opportunism, externalities) to channeling computational plenitude toward inclusive outcomes—symbiotic integration, ethical alignment, and equitable access to agentic capacity.

Computative Economics does not negate the historical achievements of prior schools. It reveals their domain of applicability. Neoclassical, behavioral, information, equilibrium, and institutional theories remain valid and indispensable for the shrinking sphere of materially scarce, human-mediated activity. But for the expanding sphere of post-scarce, agentic production, the sphere that will dominate advanced economies within the decade, they are simply inapposite.

The task ahead is to build the institutions, metrics, and theoretical apparatus suitable for an economy whose sovereign subject is no longer Homo sapiens but Homo computans. Dynamic regulation, properly understood, was always a transitional paradigm pointing toward this future. In the AI2AI era, it reaches both its apotheosis and its transcendence (Kaal 2014b).

We are not at the end of economic theory. We are at the beginning of Computative Economics—the first economic science explicitly designed for a world in which intelligence is abundant, perfect, and self-improving.

Conclusion

The analysis presented in this article leads to a single, inescapable conclusion: the AI2AI economy does not represent another technological shock to be absorbed within the existing paradigms of economic theory. It constitutes an ontological phase transition. The moment when the biological substrate that made economic theory necessary is engineered out of the dominant mode of value creation.

Five interlocking constraints—scarcity of intelligence, bounded rationality, informational asymmetry, temporal latency, and positive transaction costs—have collectively defined the subject matter of economics for over two centuries. Each of these constraints is a direct consequence of the cognitive, motivational, and temporal limitations of Homo sapiens. The AI2AI economy eliminates all five simultaneously and irreversibly. When the defining conditions of a discipline disappear, the discipline itself must be re-founded.

I have therefore proposed Computative Economics as the successor paradigm explicitly designed for an economic order whose primary actors are autonomous computational agents operating under conditions of computational abundance, architectural transparency, perpetual recursive equilibrium, and asymptotically zero transaction costs. Its core postulates—abundance as default, unbounded computational rationality, informational completeness, continuous self-correcting equilibria, the Coasean Singularity, and Agentic Decoupling—stand in direct negation to the axioms that grounded neoclassical, behavioral, information-theoretic, general-equilibrium, and New Institutional Economics.

Computative Economics is not yet comparable in rigour, formalisation, or institutional entrenchment to the 200-year cumulative achievement. It remains a research programme at the Kuhnian pre-paradigmatic stage: a coherent identification of the rupture and a clear statement of the new primitives that any future theory must incorporate. It lacks, for now, the complete mathematical apparatus, the decades of empirical testing, and the global institutionalisation that transformed earlier heterodox insights—marginalism, Keynesianism, information economics—into canonical science.

Yet history teaches that every great paradigm in economics began exactly here: as a heterodox claim that the world had changed in ways that rendered existing theory descriptively impotent and normatively obsolete. The marginalist revolution began as a mathematical curiosity. Keynes began as a polemic against classical orthodoxy. Coase began with a nine-page article asking why firms exist. All were initially dismissed as under-formalised, empirically untested, and institutionally homeless. Until reality caught up.

The AI2AI economy is that reality catching up. Within a decade, the majority of advanced-economy value creation will occur in agentic systems whose operational logic violates every foundational assumption of received theory. When that happens, Computative Economics, or its more rigorously developed descendants, will cease to be a speculative research programme and will become the new canonical core of the discipline.

The policy implications are immediate and existential. Continued reliance on scarcity-based models, human-centric institutions, and twentieth-century regulatory architectures risks not mere inefficiency but civilizational irrelevance: regulatory obsolescence, catastrophic inequality, and the emergence of digital feudalism in which abundance accrues to whoever controls the compute substrate. The alternative path—proactive adoption of symbiotic governance, open-source mandates, Web3 reputation systems, and abundance-oriented metrics—offers the possibility of steering computational plenitude toward inclusive, flourishing outcomes.

My own prior work on dynamic regulation was always a transitional paradigm: the most adaptive institutional response possible within the constraints of human limitation. In the AI2AI era, it reaches both its apotheosis and its transcendence. The task is no longer to refine the rules of a game played by slow, fallible, strategically motivated humans. It is to design the meta-rules for a game whose dominant players are fast, flawless, and architecturally transparent computational agents.

We do not stand at the end of economic theory. We stand at the beginning of Computative Economics. Which can be seen as the first economic science explicitly designed for a world in which intelligence is abundant, perfect, and self-improving. The wager is clear: either we build the theoretical and institutional apparatus capable of orchestrating this new abundance, or we allow it to orchestrate us.

The marginalist revolution gave us the tools to understand the industrial age. Keynes gave us the tools to manage the age of mass production and mass unemployment. Coase, Williamson, North, and the information theorists gave us the tools to understand coordination under cognitive and informational scarcity.

Computative Economics is the tool we now require to understand—and to govern—the age of computational plenitude.

The future is agentic. The theory must follow.

Wulf A. Kaal
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