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Theory and realism in economics: Richard R. Nelson, equilibrium and economic change

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Abstract

This paper revisits the work of Richard R. Nelson (1930–2025), focusing on his critique of equilibrium theory, to explore persistent methodological debates within the field of economics. It examines the tension between theoretical abstraction and empirical realism, arguing that Nelson's evolutionary approach offers a compelling alternative to the dominant general equilibrium framework. By foregrounding processes of change, uncertainty, and adaptive behaviour, Nelson (alongside Sidney G. Winter) challenges the discipline's tendency to model economies as static, fully understood systems. While this paper does not aim to provide a comprehensive review of their contributions, it highlights how their critique remains strikingly relevant today. Despite methodological refinements, shifts in research topics and policy engagement, mainstream economics continues to struggle with dynamic, out-of-equilibrium analysis. Revisiting Nelson's legacy is not only timely, but also essential for those seeking a more realistic and responsive economics.

Keywords Richard R. Nelson · Evolutionary economics · Equilibrium theory · Realism · Economic change

JEL Classification B15 Historical, Institutional, Evolutionary · B41 Economic Methodology · B5 Current Heterodox Approaches · D5 General Equilibrium and Disequilibrium

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1 Introduction

This paper revisits Richard R. Nelson's critique of equilibrium not only as a historical footnote to highlight his enduring relevance, but also to engage with broader debates about the nature and purpose of economic theory. Central to this discussion is the persistent methodological tension in economics, i.e., the uneasy relationship between theory and realism, a divide that has long haunted the discipline. Economists may disregard methodological issues, but at the heart of this tension lies a fundamental question posited by F. H. Kahn in 1970: "can economics explain how economies behave?". Nelson's answer, articulated with clarity and conviction in his 1982's *An Evolutionary Theory of Economic Change* book co-authored with Sidney G. Winter, is that it cannot, so long as it remains tethered to the intellectual cul-de-sac of general equilibrium theory and unrealistic assumptions. Nelson's work challenges the notion that economies can be adequately understood through the general equilibrium tradition, instead advocating for approaches that reflect the messy, adaptive, and path-dependent realities of economic life.

While there have been indeed changes in the discipline, the persistent centrality of equilibrium remains a fundamental obstacle for this discipline to lead the ways into the 21 st century. No amount of technical refinement, deviations and acknowledgement of issues such as climate change, racism and inequality, can justify economics' continued 'obsession with a 19th-century illusion' (Galbraith and Chen, 2025). By engaging with and situating Nelson within this debate, this paper invites readers to reflect on the limitations of current theoretical paradigms and to consider how a more realistic, historically grounded, and institutionally sensitive economics might better serve both scholarly inquiry and public policy. In doing so, it opens a space for reimagining the discipline not as a closed system of axioms and models, but as an evolving field responsive to the complexities of the real world.

In an era where the discipline of economics is increasingly called upon to address complex societal challenges, from climate change and inequality to technological disruption and institutional transformation, the legacy of Nelson offers a timely and necessary provocation. Nelson, a pioneering figure in evolutionary economics together with Winter, has long championed an approach that embraces historical context, institutional diversity, economic change, and the dynamic nature of innovation. His work offers a powerful counterpoint to the dominant equilibrium-based frameworks that continue to shape mainstream economic analysis and thought.

The paper is structured in four sections. Following this introduction, the next section situates Nelson's work within the current state of the discipline, highlighting its relevance to ongoing methodological debates. The third section offers a brief overview of the concept of equilibrium in economics, tracing its theoretical foundations and its role in shaping mainstream analysis. The fourth section engages directly with Nelson's critique of equilibrium, drawing primarily from *An Evolutionary Theory of Economic Change*. Finally, the paper concludes by reflecting on the urgency of revisiting Nelson's legacy and the need to guide the discipline toward more dynamic, realistic, and historically grounded approaches.

2 Richard R. Nelson and the current discipline of economics

Richard R. Nelson (1930–2025), a distinguished American economist and long-time Professor of Economics at Columbia University, made groundbreaking contributions to the study of innovation and technological change, profoundly shaping contemporary understandings of economic growth. Central to his intellectual legacy was a sustained critique of neoclassical economics, particularly its restrictive assumptions that obscure the complex processes through which new technologies emerge, diffuse, and become embedded in society. This critique found its most influential expression in his landmark book published in 1982, *An Evolutionary Theory of Economic Change*, co-authored with Sidney G. Winter, which laid the foundations for evolutionary economics.

Nelson sought to understand long-run economic development by placing technological change at its core, exploring how policy could influence both its trajectory and intensity. This approach resonated with Winter's focus on the strengths and limitations of evolutionary theory, particularly in relation to firm behaviour. Together, they soon realised they were grappling with a familiar yet deeply contested methodological issue in economics (and familiar to many other subject matters): the tension between theory and realism. Within this context, the evolutionary perspective emerged as a promising framework for developing a more realistic theory of firm and industry behaviour (Nelson and Winter,1982, p. vii).

In their 1982 book, Nelson and Winter dedicate an entire section to unpacking their understanding of orthodox economic theory. While they acknowledge that orthodoxy is "flexible and ever-changing," and that textbook caricatures may serve didactic purposes, they argue that the field is nonetheless conventionally governed by a rigid and enforced set of core assumptions concerned with the efficiency properties of market systems. Among them, there is the "assumption that all possible contingencies can be foreseen and their consequences weighted" (perfect information!), "economic actors are rational in the sense that they optimise", and a persistent reliance on equilibrium analysis. The last one rendering the discipline largely blind to historical change (Nelson and Winter, 1982, pp.7–8).[1]

What is particularly striking in their critique is the observation that, rather than relaxing the assumption of rational economic actors as theory becomes more advanced, orthodoxy doubles down. The rationality of economic agents is not softened by the introduction of complexity or uncertainty. On the contrary, as models become more complex, the rational actor becomes even more hyper-rational. As Nel-

[1] Nelson and Winter's orthodox economic theory can be associated with neoclassical economics. The definition of neoclassical economics has long been contested and remains unsettled, as discussed by Aspromourgos (1986), Zafirovski (1999), Lawson (2013), and Morgan (2016). Nevertheless, by the mid-20th century, certain conceptual pillars, such as equilibrium, rationality, scarcity, and choice, had become increasingly universal in both content and application across the discipline. Additionally, marginalism, initially developed as a framework for analysing specific aspects of human behaviour under particular conditions, evolved into a mode of analysis considered "unlimited in scope" in economics (Blaug, 2003, p. 7). In this paper, I use the terms *orthodox economics*, *mainstream economics*, and *neoclassical economics* interchangeably.

son and Winter (1982) put it: "No compromise with reality affects the treatment of economic rationality" (Nelson and Winter, 1982, p. 8). In their words,

> [a]s theoretical representations of the problems faced by economic actors increase in realistic complexity and recognition of uncertainty regarding values of the variables, there is a matching increase in the feats of anticipation and calculation and in the clarity of the stakes imputed to those actors. Never is such a theoretical actor confused about the situation or distracted by petty concerns; never is he trapped in a systematically erroneous view of the problem; never is a plain old mistake made. It is a central tenet of orthodoxy that this is the only sound way to proceed; recognition of greater complexity in the problem obligates the theorist to impute a subtler rationality to the actors (Nelson and Winter, 1982, pp. 8–9).

The critique that modern economics lacks realism is longstanding, with particular concern over the growing disconnect between abstract mathematical models and real-world issues (Lawson, 1997, 2006). A 2023 study interviewing leading heterodox economists reveals deep unease with mainstream economics' unrealistic assumptions. Many express a clear opposition, driven by a commitment to truth and a desire to reflect the diversity and contextual complexity of actual economies (Mearman et al., 2023, pp. 1122–1125). In line with this, Lee (2016) emphasises that heterodox economists insist their theories "only have real components, refer to real things, represent real entities, are judged good or bad, true or false by virtue of the way the economy works, and are causal explanations" (Lee, 2016, p. 36), reinforcing the centrality of realism as a defining principle in heterodoxy.[2]

Take for example the Global Financial Crisis of 2007–2008, which renewed attention to this long-standing criticism of mainstream economic theories. In the 1970 s and early 1980 s, the ideas of economists like John Maynard Keynes and Hyman Minsky, who emphasised the instability and unpredictability of financial markets, were gradually replaced by a different approach known as the neoclassical theory of efficient financial markets. According to the efficient market theory, financial markets work best when they are left mostly unregulated.[3] The idea is that investors, when given freedom, will choose how much risk they are willing to take to maximise their returns. This theory assumes that all market participants have access to perfect information and that prices in the market reflect the true value of assets, because they are

[2] Heterodox economics is an umbrella term for diverse traditions that offer alternative ways of teaching and researching economics compared to the dominant approach in top universities. The term itself dates back to the early 20th century, appearing in works such as Ayres (1936) and Commons (1932). Its modern usage, however, gained traction from the 1960 s onward as a reaction to economics becoming increasingly narrow and intolerant of other approaches. Defining the term precisely is challenging, but for those wishing to explore further, see Jo, Chester, and D'Ippoliti (2025), *The Routledge Handbook of Heterodox Economics: Foundations, Theoretical Cores, and the Anatomy of Capitalism*, and Saith (2022), *Cambridge Economics in the Post-Keynesian Era: The Eclipse of Heterodox Traditions*, as well as key articles such as, Alves and Kvangraven (2019), Dow (2008), Dymski (2014), Vernengo (2014), Mearman (2012), Lawson (2006), Lee (2009), and Wren (2007).

[3] As Beker (2016) argues, "[n]eoclassical economics can be blamed for creating the ideological climate that stimulated the deregulation movement in the USA during those decades" (Beker, 2016, p. 189).

set by rational individuals who aim to maximise their personal satisfaction (known as utility). This leads to a methodological issue of the relationship between assumption, conclusion (derived hypotheses) and realism (Crotty, 2017, pp.13–16).

Unfortunately, few mainstream economists engage with methodology. As Wren-Lewis (2014) puts it, somewhat caricatured but not far off the mark, "[a]fter all, doctors do not spend large amounts of their time worrying about the methodology of medicine. So why should economists?". The problem is that this stance often defaults, implicitly or explicitly, to Milton Friedman's (1953) version of positivism, which is the methodological foundation of modern neoclassical economics. In this view, the realism of assumptions, whether institutional, behavioural, or empirical, is irrelevant. What matters is whether the theory's predictions align with past data (Crotty, 2017, pp. 16–17). Assumptions are not judged by their realism but by the testability of their conclusions.

Paradoxically, and much to Friedman's likely dismay, macroeconomic forecasting has long been criticised for its poor predictive performance, particularly when based on conventional model-driven approaches (Trichet, 2010; see also Christiano, Eichenbaum, and Trabandt, 2018, and Colander et al. 2008). These forecasts tend to fail systematically, except during periods of mild fluctuations. This partly explains why, during the Great Moderation period in advanced economies (mid-1980s to 2007), forecasting appeared to improve, given that economic volatility was unusually subdued. Studies with the mainstream of the profession, such as, Reis (2010) and (2018), acknowledge this problem but ask us to "reading forecasts as probabilistic statements where the confidence bands or fan charts are as or more important than the point forecasts" and for "an evaluation of forecasting performance in relative terms" while exploring alternatives for improvement (Reis, 2018, pp. 147–148). On the other hand, approaches rooted in a heterodox economics, such as Nikiforos and Zezza's (Nikiforos and Zezza, 2017; Nikiforos and Zezza, 2022) goes beyond improvements and towards models that aim to produce economically meaningful forecasts by capturing a wider range of real-world interactions and potential instabilities, rather than prioritising short-term accuracy based on narrow indicators. Nikiforos and Zezza's approach emphasises the integration of real and financial sectors within a coherent analytical framework, in stark contrast to traditional models that often neglect the dynamic role of finance in shaping economic outcomes.

Interestingly, Nelson and Winter's 1982 work also refer back to Milton Friedman, when the authors are grappling with the concept of static selection equilibrium and its relationship to evolutionary arguments in economic theory.[4] They argue that the idea of selection equilibrium has a "natural" connection to orthodox economic theory, particularly the profit-maximising concept, as competition tends to eliminate firms that fail to maximise profits efficiently. For them, Friedman has the "best-known articulation" of this position (Nelson and Winter, 1982, pp.139–140). Friedman suggests that regardless of the immediate determinants of business behaviour, be it habit, chance, or other factors, firms that behave in ways consistent with rational and informed profit maximisation will thrive and accumulate resources. Conversely, those that do

[4] The argument presented by Nelson and Winter in this section of their book draws heavily on Winter's earlier work, particularly his papers published in (1964) and (1971).

not will lose resources and survive only through external support. As Friedman puts it:

> Let the apparent immediate determinant of business behavior be anything at all-habitual reaction, random chance or what not. Whenever this determinant happens to lead to behavior consistent with rational and informed maximization of returns, the business will prosper and acquire resources with which to expand; whenever it does not the business will tend to lose resources and can be kept in existence only by the addition of resources from outside. The process of natural selection helps to validate the hypothesis (of maximization of returns -N -W)-or, rather, given natural selection, acceptance of the hypothesis can be based largely on the judgment that it summarizes appropriately the conditions for survival (Friedman, 1953, p. 22).

Overall, one can argue that the 2007-8 Global Financial Crisis triggered another kind of contagion, one that led to a widespread criticism and rethinking of economics. The crisis catalysed a wave of critical reflection, sparking a proliferation of papers, blogs, op-eds, and reform initiatives. Long-standing critics of neoclassical economics found renewed momentum. It became inevitable to reflect on the Great Depression of the 1930 s and the changes that followed in the discipline. For the first time in decades, meaningful change in the discipline seemed not only necessary but possible. Yet in 2026, frustration with economics remains. The urgency of climate breakdown, shifting geopolitics, and disruptive technological transformations has only intensified calls for a more human-centric and realistic economics.

Angus Deaton, Nobel laureate in Economics, captured this disillusionment in a 2024 IMF publication, noting that while economics has achieved much, the profession is "in some disarray." He laments, for example, that economists have "largely stopped thinking about ethics and about what constitutes human well-being," becoming "technocrats who focus on efficiency" while neglecting deeper questions of welfare and equality (Deaton, 2024, p. 20). Ha-Joon Chang, Professor of Economics and winner of the Gunnar Myrdal Prize and the Wassily Leontief Prize, stated in a recent o-ped at the *Financial Times* that 'the dominance of neoclassical economics in our university curricula has created a world where we are told there is no alternative, only technical adjustments to a system that is fundamentally fair, rational and efficient" (Chang, 2025). A 2024 UK national report, *Is Economics Education Fit for the 21 st Century?*, shows that most universities still prioritise teaching students to "think like economists" — a mindset rooted in neoclassical models — over fostering a real understanding of how economies function (Ross & Nelson, 2024). For instance:

- **88.3%** of theory modules focus on rational, self-interested individuals and are taught almost entirely through quantitative techniques.
- **75%** of universities do not teach ecological economics, and when issues of ecological sustainability are taught, environmental damages are framed merely as costs to be priced into market mechanisms.

Nelson's legacy, particularly his critique of neoclassical economics, remains largely absent from mainstream curricula. Today, most undergraduate and graduate students encounter little, if any, exposure to his work. In the 1970 s, Nelson published in some of the discipline's most prestigious journals, including *The Quarterly Journal of Economics* and *The American Economic Review*. However, nowadays, it is unlikely we will see in these journals papers following Nelson's contributions and legacy. As Heckman and Sidharth (2020) argue, the dominance of the so-called "Top Five" journals has reshaped academic priorities: topics that cannot be published in these outlets are often deemed unworthy of scholarly pursuit (Heckman and Sidharth, 2020, p. 420). The absence of Nelson's work from these journals today suggests that his contributions are no longer considered relevant to the profession, despite their enduring relevance in areas such as economic innovation and intellectual property.

It is therefore unsurprising that Nelson collaborated with *The Other Canon Foundation*, a network of heterodox economists founded in 2000 by Erik Reinert, a Norwegian economist and Professor of Technology Governance and Development Strategies at Tallinn University of Technology. This network highlights a rich yet marginalised intellectual tradition within economics. Drawing on Schumpeterian insights, *The Other Canon Foundation* centres its analysis on the dynamic nature of economic systems, prioritising disequilibrium, innovation, and historical transformation over static models and equilibrium frameworks (*The Other Canon Foundation* website, 2025). Nelson's dedication to developing a more realistic theory of the firm, combined with his active involvement in *The Other Canon Foundation* network, allow us to place him close to the heterodox tradition.[5]

Today, Nelson's influence persists in journals like the *Journal of Industrial and Business Economics*, which fosters "critical reflections on worldwide grand challenges at the intersection between economics, business and policy" (JIBE, 2025). And critics continue to voice their frustrations and offer alternative ways of theorising economics; often through publications in journals sidelined by the mainstream, and in discussions on economics education, such as the recent special issue "Anti-Capitalist Pedagogies and Teaching Radical Economics" (Ramnarain et al., 2025). Yet, compared to the energy of the early 2010 s, there is now a palpable sense of defeat. This is especially evident in the face of economists' hubris surrounding the so-called *credibility revolution* in econometrics (the empirical turn), and the claim that the discipline has broadened and improved because topics like inequality and climate change are now more visible.

Indeed, economics has evolved significantly since the time of Alfred Marshall, who was instrumental in institutionalising what became known as the neoclassical school anchored in marginalist principles (Aspromourgos, 1986; Fine & Milonakis, 2009). While neoclassical economics continues to dominate the discipline, what we now encounter is the 'late neoclassical economics', as suggested by Madra (2017), which is a contemporary variant that extends beyond neoclassical and marginalist principles. Today's late neoclassical economics incorporates a diverse array of theoretical developments, including behavioural and experimental economics, new insti-

[5] For a different view on Nelson's relationship with heterodoxy, please, see Tae-Hee Jo's (2021) "*A Veblenian Critique of Nelson and Winter's Evolutionary Theory*".

tutional economics, and evolutionary game theory (Coyle, 2007; Colander, 2009; Colander et al., 2010). These additions reflect a broader, more nuanced landscape, which leads Deaton (2024) to talk about a "perhaps nebulous mainstream" of the profession.[6]

Nonetheless, the discipline has continued to uphold equilibrium as one of its foundational principles. This lends enduring relevance to Wootton's argument from the 1930s: equilibrium serves as the "stock-pattern key" to unlock every theoretical problem in the market, making economic inquiry fundamentally dependent on this postulate (Wootton, 1938, pp. 38–39). Perhaps the most significant development in this regard has been the ongoing mathematisation of general equilibrium theory throughout the 20th century and into the present day. For this reason, Nelson's critique and push for evolutionary economics is more pertinent than ever.

2.1 Equilibrium, a "19th-century illusion"

General equilibrium theory in economics assumes that the economy consists of a network of interrelated markets, each operating independently. Within each market, supply and demand are assumed to adjust naturally over time given that prices are flexible. This adjustment converges toward a state of equilibrium, where the market price settles at a level such that the quantity of a good or service demanded by consumers exactly equals the quantity supplied by producers.

The general equilibrium theory presents a worldview in which the economy tends toward a stable equilibrium, a condition that can be identified and understood. While short-term fluctuations and shocks may occur, the theory denies the existence of long-term uncertainty. Everything is presumed to move toward a predictable and stable outcome. Chappe (2016), while presenting critical commentary on the standard textbook *Microeconomic Theory* by Andreu Mas-Colell, Michael Whinston and Jerry Green, which is currently used in PhD programs in economics around the world and widely viewed as an academic standard, highlights that if one is adopting an equilibrium approach, one can hardly quarrel with the ambition that "we must simultaneously determine the equilibrium values of all variables of interest" (Mas-Colell et al., 1995, p. 511).

It can be argued that this formulation of general equilibrium starts with Léon Walras's (1834–1910), long regarded as the canonical model in economics, who constructs this equilibrium from the ground up. That is, achieving balance from basic principles or foundational elements. Central to his approach is the concept of a hypothetical auctioneer, who acts as an invisible hand by adjusting prices until all markets clear. Walras and others worked on mathematically identifying the conditions under which a price system might enable supply to be equated to demand simultaneously in all markets for traded commodities (Chappe, 2016). This bottom-up mathematical framework relies on several idealised assumptions: individuals are rational and self-interested, their preferences are exogenously given, and contracts are complete and

[6] For a detailed discussion about the changes, extensions, deviations, and developments within neoclassical economics see Colander et al. (2010), Dequech (2007, 2012), Dow (1997) and Lawson (2013).

costless. These conditions allow for a rigorous and elegant representation of human behaviour within the model.

Alfred Marshall (1842–1924) took the baton from the Walrasian school and ran with it, though not in a straight line. Building on equilibrium models, Marshall infused neoclassical economics with a dose of realism: allowing for non-selfish motives, endogenous preferences, and empirical grounding (Colander, 1995). Marshall also recognised that although certain disturbances are temporary, they may nonetheless produce enduring changes in the trajectory of economic development. Consequently, the economy does not necessarily return to its prior position after a shock. Additionally, he emphasised the irreversibility of time: economic processes unfold in a temporal sequence that cannot simply be reversed, in contrast to the reversible dynamics often assumed in physics. For Marshall, acknowledging these features of economic life demanded a commitment to realism of analysis (Hart, 2012; Missos, 2017; Rosser, 2010).

Marshall's writings reveal a persistent tension concerning the compatibility of equilibrium and evolutionary change. The concept of equilibrium, as he understood it, inevitably abstracts from the causal forces and historical processes that shape economic activity (Hart, 2003, p. 1145). This tension pushed Marshall toward biological analogies and, more broadly, an evolutionary approach that he believed offered the most promising direction for economic inquiry. His lesser-known legacy is therefore an incomplete but indicative attempt to lay the foundations of an 'economic biology'.

As Hart (2003) succinctly puts it:

> …the chief source of Marshall's difficulties in *Principles of Economics* arose from an unsuccessful attempt to construct an equilibrium concept that could be used to shed light on the outcomes of processes that are recognized as being continuous and irreversible in time (Hart, 2003, p. 1140).

In contrast, the Walrasian framework began to falter under scrutiny, criticised for its rigid assumptions, such as self-interested agents, exogenous preferences, and frictionless markets (Bowles & Gintis, 2000). Marshall pushed for assumptions rooted in observed behaviour: heterogeneous yet patterned, shaped by incomplete markets and institutional contexts, incorporating the particularities of human motivations and institutions into neoclassical equilibrium models. While Walras models are static equilibrium models based on individual rational agents, mathematical Marshallian models tend to take a partial equilibrium approach emphasising the use of representative agents/firms (Madra, 2017). Nonetheless, both positions ascribe a constitutive role to the model of perfect competition as their ultimate point of reference.

Marshallian models opened avenues for economic theorising that did not begin with same strict assumptions of human behaviour that Walras did (Bowles and Gintis, 2000). Equilibrium analysis was further developed and refined since, including most famously by Arrow and Debreu in the 1950 s, with equilibrium being a situation where quantities and prices do not change, as there is no incentive on anyone's part to change (Arrow, 1974). The Arrow-Debreu development paved the way for what we today know as general equilibrium theory. In fact, it was only "in the early 1950 s, with the work of Arrow and Debreu, that research in the area of study that came

to be called general equilibrium theory led to a formal demonstration of conditions for such an equilibrium to exist and to have specific desirable properties" (Chappe, 2016). It also set the tone for the discipline to become more focused on choices that households, firms, and workers make, given their preferences, budget constraints, and relative prices. This centrality of choice gives the impression of both consumer and firm autonomy in a market economy seen in Milton Friedman's 1962 widely acclaimed book *Capitalism and Freedom*.

Economists have generally seen this shift towards the general equilibrium theory as a positive development, believing it to be in the interest of "coherence and consistency" (Arrow and Hahn, 1971, p. 2). Chappe (2016) states that one of the arguments as to why it has been successful is that it helps to establish the conditions under which 'market economies' have certain desirable properties. The other, rather more specific, involves the idea that "it aims at reducing the set of variables taken as exogenous to a small number of physical realities (e.g. the set of economic agents, the available technologies, the preferences and physical endowments of goods of various agents)" (Mas-Colell et al., 1995, p. 511).

Critiques of equilibrium in economics are longstanding and wide-ranging, beginning with the difficulty of providing a coherent definition of equilibrium within modern economic theory itself (Lawson, 2005). Even on its own terms, the equilibrium framework is fragile. A central illustration of this fragility is the Sonnenschein–Mantel–Debreu (SMD) aggregation problem of the 1970 s, which directly challenges the foundations of aggregate demand theory at the core of orthodox economics. The SMD results demonstrated that no plausible set of assumptions about individual behaviour can ensure either the uniqueness or the stability of an aggregate equilibrium. In doing so, they undermined the analytical coherence of general equilibrium theory as a macroeconomic framework (Kirman, 1992).

Although these findings exposed deep theoretical inconsistencies and precipitated a period of crisis for the general equilibrium research programme (Lenfant, 2011), they did not redirect the discipline toward the kind of evolutionary or dynamic frameworks later articulated by Nelson and Winter. Instead, the response was a progressive tightening of increasingly restrictive and ad hoc assumptions, culminating in the widespread adoption of the representative agent. This construct effectively reduces economic agents to a mathematical abstraction, severed from empirical, social, and behavioural reality. As Kirman (1992) famously observed, in the aftermath of the SMD aggregation problem, "it should be clear by now that the assumption of a representative individual is far from innocent; it is the fiction by which macroeconomists can justify equilibrium analysis and provide pseudo-microfoundations" (Kirman, 1992, p. 125).

Another key criticism is that the concept is rooted in an outdated worldview: one that predates major developments in physics and biology from the late 19th century. It reflects a mechanistic and deterministic understanding of economic systems, rather than one that embraces complexity, evolution, and genuine uncertainty (Galbraith and Chen, 2025). Chappe (2016) highlights that economics textbooks often claim that "little is lost," presumably to simplify and clarify ideas. Yet something *is* lost: namely, a meaningful account of system dynamics. This omission fundamentally undermines the explanatory power of equilibrium. Here, Chappe (2016) reminds us

of Vela Velupillai's (2005, 2009, 2015) brilliant contributions and eloquently summarises them as follows: "it cannot be known in advance that any tâtonnement like process could ever work, since that would amount to solving the halting problem of a Turing machine, known to be 'undecidable'"(Chappe, 2016).

In this vein, a less frequently noted aspect in the development of general equilibrium theory is its role in countering a once-prominent idea from the late nineteenth and early twentieth centuries: *the notion of market anarchy*. This view characterised markets as inherently chaotic, unregulated, and unjust. Thinkers such as Benjamin Tucker and Lysander Spooner, both individualist anarchists, argued that this apparent anarchy did not arise from genuine market freedom, but from a distorted system of state-enforced privileges benefiting the capitalist class (see Boldizzoni, 2019). General equilibrium theory emerged in this context, offering a framework through which markets could be conceptualised as tending toward stability and efficiency rather than disorder and eventually becoming a foundational pillar of mainstream economics (Chappe 2016). Gradually, it reframed financial instability, unanticipated technological shocks, and other extrinsic random variables, such as *sunspots*, as mere deviations from an otherwise orderly system.

2.2 Equilibrium *versus* economic change

Nelson's work on technological change led him to embrace the uncertain, exploratory, disorderly, and error-ridden character of this process. His perspective stands in stark opposition to the neoclassical framework, highlighting the disorderly and evolutionary character of economic processes (Nelson and Winter, 1982, p. vii). It is not a surprise that by 1990 s, for example, Nelson is publishing at the *Strategic Management Journal* on "Why do firms differ, and how does it matter?*"* arguing that he would be "fighting against a strong tide in economics, particularly in theoretical economics", as "[i]n virtually all economic analyses, differences among firms in the same line of business are repressed, or assumed to reflect differences in the market environments that they face" (Nelson, 1991, p. 61). He then states among other things that

> [t]he tendency to ignore discretionary firm differences … reflects, as well, some strong theoretical views held by most main line economists about what economic activity is all about, and about the role and nature of firms in economic activity. My argument that discretionary firm differences within an industry exist and do matter significantly is part and parcel of my broader argument that neoclassical economic theory is badly limited (Nelson, 1991, p. 62).

Nelson goes back to how since the formulation of general equilibrium theory, "the focus has largely been on how well an economy allocates resources, given preferences and technologies" (Nelson, 1991, p. 63). This means a very particular view on economy activity, which makes the central economic problem as that of meeting preferences, given resources and prevailing technologies and institutions. "This perspective implies a rather limited view of what firms are about" (Nelson, 1991, p. 63). In this context,

> economists became wedded to a theory of firm behavior that posited that firms face given and known choice sets (constrained for example by available technologies) and have no difficulty in choosing the action within those sets that is the best for them, given their objectives (generally assumed to be as much profit as possible). Thus the 'economic problem' is basically about getting private incentives right, not about identifying the best things to be doing, which is assumed to be no problem (Nelson, 1991, p. 63).

Nelson also highlights his concern with innovation in this context, arguing that the neoclassical models "in question completely miss what is involved in innovation" (Nelson, 1991, p. 65). Essentially, Nelson argues that the treatment of technological and organisational innovation by the neoclassical literature

> simply takes the given 'choice set' and 'maximizing over it' presumptions of standard neoclassical theory and applies them to 'innovation.' That is, innovation is treated as basically like any other choice. Investment costs may need to be incurred before the new product or organizational design is ready to be employed, but in neoclassical theory this is true of other capital goods like a bridge or a machine. There may be high risks involved in doing something new, in a formal sense of that term, but this is treated as statistical uncertainty with the correct probability distribution known to all as is standard in micro economic theory (Nelson, 1991, p. 66).

More generally, in standard economic models, innovation is often treated as a smooth and predictable process. This framing reflects an analytical environment characterised by constant or diminishing returns, in which market outcomes are largely determined by endowments, consumer preferences, and available technologies. Under these conditions, small events or random shocks have limited influence on long-run outcomes, rendering market trajectories highly stable and predictable.[7] This portrayal contrasts sharply with the work of Brian Arthur, who is especially well known for arguing that technology develops within a complex adaptive system: it both shapes, and is shaped by, institutions such as firms, markets, and regulations. In this view, innovations emerge through processes of combination and selection (Arthur, 2021; Arthur et al., 2020). We see this in his most notable work on markets characterised by increasing returns (Arthur, 1989), which are prevalent in high-technology industries such as software, digital platforms, and advanced manufacturing. Economies with increasing returns amplifies "the effects of small economic shifts" (Arthur, 1989, p. 92). Because of this, he treats increasing returns as a stochastic (that is, partly random) processes with multiple possible outcomes. In such contexts, precise prediction is largely illusory. As developed by economist and complexity scientist Brian Arthur

The policy implications of this distinction are significant. In settings with diminishing returns, where minor events or shocks hold little sway over the ultimate out-

[7] It remains to be seen to what extent the 2025 Nobel Prize in Economics, awarded to economists Philippe Aghion, Joel Mokyr, and Peter Howitt for their work explaining innovation-driven economic growth will reshape the teaching and research landscape in innovation.

come, policy interventions that aim to shape technological trajectories often involve an implicit choice over which technologies to support (Arthur, 1989, p. 127). This entails a bet that may result in inferior technologies becoming dominant, for example. For this reason, the most effective policy approach is not to 'pick winners', but to create conditions under which multiple technologies can emerge and compete, through measures such as lowering barriers to entry or development. On the other hand, under increasing returns, institutions responsible for innovation policy are crucial. They do not need to choose in advance which technology will succeed, instead they must be prepared for unpredictable outcomes and ready to address the negative social and economic externalities that may follow from technological change (Arthur, 1989). In this sense, Arthur's work on increasing returns highlights a key insight: well-designed regulation does not inhibit markets, but help create dynamic and innovative systems, particularly under conditions of uncertainty.

Also, orthodox economic theory focuses on the determination of equilibrium prices, inputs, and outputs under conditions of supply and demand. Within the framework of partial equilibrium analysis, this involves deriving output supply functions, establishing relationships between firms' input proportions and relative factor prices, and similar exercises. When demand or prices change, the theory assumes that behavioural adjustments occur instantaneously, and that all market participants perfectly anticipate these changes and the resulting equilibrium outcomes. However, as Nelson and Winter (1982) argue, this approach fails to illuminate how firms and industries actually respond to exogenous shifts in market conditions. It also overlooks the processes and impacts of innovation. In their view, orthodox analysis offers little insight into the dynamics of economic change. This raises a fundamental question: can economic analysis truly predict, explain, evaluate, or prescribe change? (Nelson and Winter, 1982, p. 24)

Nelson and Winter (1982) see the above as the awkward treatment of economics change by orthodoxy theory. They argue that, despite appearances, the theory fails to directly address what happens when there is a shift in product demand or in the price of a factor of production. In reality, firms respond to changing market conditions in ways that are time-consuming and based on incomplete information. These responses are not instantaneous or perfectly calculated. Instead, firms often face surprises due to unforeseen changes, and their behaviour in the immediate aftermath cannot be accurately described as "maximising" in the simplistic sense assumed by orthodox theory. Consequently, industries are likely to be out of equilibrium for some time following a market shock. Without the assumption of perfect foresight, or something very close, one must acknowledge that market changes can catch firms off guard (Nelson and Winter, 1982, pp. 24–25).[8]

With the conclusion that economists interested in the theory of the firm are "struggling to break away from the orientation of general equilibrium theory, which sees the economic problem as allocating resources efficiently, given technologies" (Nel-

[8] The authors acknowledged that at the time there was a discussion around 'suboptimal policies' or 'friction in economic adjustments'. However, in these models, changes happen immediately or permanently, or the approach fails if we accept that firms' reactions to initial price imbalances will probably alter those prices in unpredictable ways. Also, the direction of a suppose adaptive response is always the same direction of profit maximisation and the adaptive process will ultimately converge to a new equilibrium.

son, 1991, p. 66), Nelson rescued Schumpeter's insistence "that the focus of general equilibrium theory was on questions that, over the long run, were of minor importance compared with the question of how capitalist economies develop, screen, and selectively adopt new and better ways of doing things". For Nelson, the dynamic processes Schumpeter described are not even captured by the new neoclassical models developed by economists who call themselves 'neo Schumpeterians' (Nelson, 1991, p. 66).

Nelson calls in for the need of a different theory that may lead to very different view of the economic problem, in this case, he calls evolutionary theory where firm differences play an essential role (Nelson, 1991, p. 66). Drawing on his book co-authored with Winter in 1982, he makes clear that there is the need of "presenting a 'theory of the firm' which is consistent with, and motivates, a Schumpeterian or evolutionary theoretic view of economic process and economic change", which considers the contribution for the likes such as Herbet Simon and Edith Penrose, and Alfred D. Chandler Jr.

Nelson and Winter (1982) argue that an evolutionary theory provides a more compelling framework for analysing economic change, whether driven by demand, supply, or innovation by firms. Their focus is primarily on the behaviour of business firms within a market environment. However, I would contend that their broader objective is to understand economic change itself, to grasp the dynamics of economic transformation itself, a concern that was central in their time and remains vital across various fields in economics, including economic history, policy, and development. In relation to the latter, and ahead of their time, Nelson and Winter already in the book 'overview and motivation,' challenged the orthodox preoccupation with neutrality and the neglect for the environment, as they contextualised economic change not only within issues of modernisation and the catch-up problem but also emerging concerns about the long-term ecological sustainability of advanced industrial societies and the deeper relationship between material progress and fundamental human values (Nelson and Winter, 1982, pp. 3–4).

Starting with adaptive instead of maximising responses to any changes open more realistic venues to understand economic changes and economic responses to changes. For the authors, firm and industry response to market condition "is not derivable from the textbook formalism about profit maximising and equilibrium constellations" (Nelson and Winter, 1982. p. 24). Adaptive models may or may not generate time paths that converge to equilibrium. The authors relied on F. H. Hahn (1970) presidential address to the Econometrics Society from over ten years before their publication to make the case that "economists had made little progress in modelling plausible processes of disequilibrium adjustment that converge to general competitive equilibrium" (Hahn, 1970, p. 24). For Hahn, the Walrasian tatonnement, which is the institutional assumption on which most of the extant stability theorems depend, are plainly artificial. He noted the absent understanding of dynamic adjustment process out of equilibrium, something also noted by Paul Samuelson (1947) but neglected by the profession at that time. Hahn had strong words for the profession: "the study of equilibrium alone is of no help in positive economics …. The time has come to see whether it can serve in an analysis of how economies behave. The most intellectually exciting question on our subject remains: is it true that the pursuit of private

interests produces not chaos but coherence, and if so, how is it done?" (Hahn, 1970, pp.11–12).

In contrast to Milton Friedman's simplistic invocation of evolutionary logic to justify competition and profit-maximising behaviour (mentioned in section one), the authors align more closely with Armen Alchian's nuanced view of firm behaviour. Alchian emphasises the role of chance, learning through trial and error, imitation, and selection pressures in shaping firm outcomes (Nelson and Winter, 1982, p. 140).[9] Unlike Friedman, who treats profit maximisation as a self-evident outcome of market selection, they argue that his framework ignores the temporal and stochastic nature of economic processes. Prosperity and resource accumulation do not happen instantaneously; it takes time for profit-maximising behaviour to translate into economic dominance of these firms. If firm behaviour is driven by randomness or contingent factors, there's no guarantee that firms acting in line with profit maximisation today will continue to do so tomorrow. Consequently, there's no inherent reason to expect a cumulative selection process favouring profit-maximisers over time. As Nelson and Winter put it, "to the extent that behaviour is random, there may be no systematic selection at all" (Nelson and Winter, 1982, p. 141–142).

The authors demonstrated a bold intellectual honesty that likely upset the prevailing orthodoxy. They were explicit in stating that a "precondition for significant growth in our understanding of economic change" is the "reconstruction of the theoretical foundations of our discipline" (Nelson and Winter, 1982, p. 4).

In their evolutionary theory of economics:

- Firms are motivated by profit, but their behaviour is not assumed to be profit-maximising within a well-defined and exogenously given choice set.
- While more profitable firms tend to drive less profitable ones out of business, the theory does not rely on hypothetical states of 'industry equilibrium' where only profitable firms remain and operate at optimal scale.
- There is no use of maximisation calculus to derive equations that characterise firm behaviour.
- Firms are modelled as possessing, at any given time, specific capabilities and decision rules. These evolve over time through both intentional problem-solving and random events.

Borrowing concepts from biology they replace static equilibrium with dynamic processes of *economic natural selection*. Here, firm survival and growth are not predetermined outcomes of rational optimisation, but contingent on differential success within a competitive environment. As Nelson and Winter (1982) put it, "patterns of differential survival and growth in a population of firms can produce change in economic aggregates characterizing that population, even if the corresponding characteristics of individual firms are constant" (Nelson and Winter, 1982, p. 9). This

[9] The contrast between Alchian's and Friedman's approach made clear to them that there was no reason to adhere to the orthodox theory and that there may be important differences between an orthodox and an evolutionary perspective. Equally important, it led them to confirm the still need for an evolutionary theorising in economics.

insight decisively shifts the focus from equilibrium to transformation: economic change emerges not from firms adjusting toward a fixed point, but from the cumulative effects of selection, adaptation, and variation over time. To deepen this perspective, the authors also introduce *organisational genetics*, a concept that captures how organisational traits, including those tied to production and profitability, are transmitted and modified across time. In short, their approach dismantles the equilibrium metaphor and replaces it with a theory of economic evolution grounded in historical continuity, institutional inheritance, and structural change.

3 Conclusion

Nelson, together with Winter, has been a breath of fresh air for our profession. In this paper, I focused on their critique of equilibrium to spotlight a persistent methodological tension in economics: theory versus realism. Their work reminds us loud and clear that the economy is always undergoing change, most of it unpredictable, and that any theory assuming agents fully understand their context or that the system is in equilibrium is simply not up to the task of addressing many of the discipline's and society's most pressing questions.

Because of this focus, the paper doesn't do full justice to their contributions on adaptive firm behaviour or their elaboration of an evolutionary theory of economics, especially in their 1982 book. But I hope it serves as an invitation: to those already familiar with Nelson's work, keep pushing this conversation into the core of the discipline. And to those who harbour doubts about the general equilibrium framework, dive into the chapters where adaptive models come alive. You might just find the fresh air you've been looking for.

Now, when we praise the profession of economics today, especially its role in shaping policy, can we really say we've answered Hahn's 1970s challenge: *can economics explain how economies behave*? Back then, for Hahn, the best technical work was focused on equilibrium alone, not taking into consideration the out of equilibrium dynamic aspect. And now? A quick scan of our top five journals (*AER*, *Econometrica*, *JPE*, *QJE*, and *ReStud*) shows a range of topics from public R&D to price regulation and fiduciary duty. But let's be honest: how far have we actually moved beyond equilibrium alone analysis?

I remain unconvinced by the progress Hahn, Nelson, Winter and others hoped for. I find myself siding with Nelson and Winter's 1982 take: economics still hasn't found a coherent and sustainable path beyond the intellectual cul-de-sac of general equilibrium theory. That's why revisiting Nelson's legacy is not just relevant, it's urgent. And we need to guide students and scholars toward the journals where these deeper, more dynamic debates are happening. Yes, there's been changes. But let's not kid ourselves. Even if one accepts general equilibrium as a useful framework (I don't), the real issue is this: we're barely engaging with dynamic, out-of-equilibrium processes, especially how firms and industries respond to shocks. Samuelson flagged this problem in 1947. Nelson and Winter called out the profession's casual neglect of it. And frankly? That neglect still lingers.

I also believe the discipline must re-engage with Milton Friedman's 1953 essay and his claim that unrealistic assumptions can still yield useful predictions. Can such assumptions truly help us understand not only firm behaviour, but also human behaviour more broadly? This question remains central to the future of economic inquiry, especially as we confront the limitations of models that abstract away complexity, uncertainty, and historical context.

Declarations

Conflict of interest The author states that there is no conflict of interest, and no relevant financial or non-financial interests to disclose.

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