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Towards an Enriched Research Approach to Evolutionary Economics: The Orientation of Macro-Meso-Micro Dynamics and Critical Realism

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Abstract

This paper examines the theoretical roots and methodological underpinnings of evolutionary economics, proposing a direction to enrich its research methodology. It contends that the field's core is built on a tripartite analysis of innovation dynamics, biological interpretations, and institutional transformations. By integrating this dialectical perspective with the macro-meso-micro framework and critical realism, a solid methodological foundation can be established for more comprehensive investigations in evolutionary economics research. The paper concludes by emphasizing the need for practical application within the field, highlighting the importance of operationalizing these aspects to improve the analytical and interpretive capabilities of existing pertinent methodologies.

Keywords: economic research methodology, evolutionary economics, macro-meso-micro
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1. Introduction

Evolutionary economics, a distinct field of research, has increasingly captivated scholars and sparked vigorous debates about its methodological foundations and interpretive "geometry." In contrast to conventional neoclassical economics, which focuses on utility maximization and perfect rationality through a positivist perception, evolutionary economics adopts a different approach. Despite its innovative perspective, the field has faced criticism for its somewhat ambiguous methodology (Geisendorf, 2009; Klaes, 2004; Vromen, 2004). A pivotal advancement was marked by Nelson and Winter's (1982) groundbreaking work, introducing an innovative method of economic analysis. Their approach, advocating

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for highly sophisticated simulations and algorithms, aimed to delve into market behaviors, competition, and the evolution of business strategies, drawing parallels with biological concepts such as variation and natural selection.

Recent scholarly efforts have aimed to refine the methodological basis of evolutionary economics to strengthen its theoretical outcome. Dopfer and Potts (2004) highlighted its inherently interdisciplinary nature, advocating for an expansive analytical framework that spans micro, meso, and macro. Klaes (2004) characterized evolutionary economics as a significant yet vague field, proposing its interpretation as a social institution. Vromen (2004) tackled misconceptions about Darwinian processes in capitalist economies from an evolutionary standpoint, while Geisendorf (2009) promoted a balanced approach, incorporating the concept of self-organization within a biological metaphor in evolutionary economics.

This study raises the question of how and to what extent the foundational methodological approaches of evolutionary economics can be enriched and strengthened in the current context. Although the recent methodological innovations in evolutionary economics are compelling, we argue that they can be further improved to present stronger arguments about the application of the research path of evolutionary economics, especially in various sectoral contexts. Therefore, this paper seeks to explore the potential for enrichment within evolutionary economics, aiming to provide a more effective framework for understanding the dynamics across diverse sectors and areas of socioeconomic activity.

We will conclude that two essential components emerge as fundamental for the methodological strengthening of this economic paradigm: the macro-meso-micro framework and the perspective of critical realism. Notably, critical realism, which developed independently from evolutionary economics, potentially offers significant background enhancement in the field. Conversely, the integrative macro-meso-micro framework appears to be intrinsic for the further progress of evolutionary economics.

The enhancement we propose for research methodologies in evolutionary economics stems from the observation that the prevalent approach in top economic journals, including those dedicated to evolutionary economics like the Journal of Evolutionary Economics, seems to adopt sometimes a positivist stance (e.g., Coad, 2018; Reichstein et al., 2010). This conventional stance often leads to a fragmented analysis of economic phenomena, overlooking the possibility of a comprehensive understanding of the socioeconomic issues at hand. Moreover, the “allegedly” sharp division between positive and normative perspectives in the field of economics frequently hinders rather than fosters the advancement of meaningful scientific discourse. Such a tendency to sideline the evaluative and ideological aspects of economic science reflects the traditional frameworks of neoclassical economics, which may conceal the core and distinctive interpretive perspective of evolutionary economics (Boland, 1991; Caplin & Schotter, 2008; Friedman, 1953; Holcombe, 1989; Mirowski, 1992; Schmid & Thompson, 1999). However, it is essential to recognize the body of work within this field and associated alternative, “heterodox” economic theories that align with our viewpoint, even if they do not overtly define the methodological tenets intrinsic to evolutionary economics (Castellacci, 2006; Elsner, 2007; Hodgson, 2006). Our discourse, therefore, emphasizes the imperative for augmenting

and reinforcing the interpretive underpinnings and procedures of evolutionary economics' methodological orientation. By adopting the approach we suggest, a more holistic and cohesive examination of the coevolutionary dialectical relationships among socioeconomic phenomena at the macro, meso, and micro can be achieved (Bhaskar, 1993).

The structure of the paper is as follows: Section 2 examines the basic theoretical roots of evolutionary economics. Section 3 presents the macro-meso-micro framework and its critical relevance to this field. Section 4 delves into the field's ontological and epistemological dimensions. Section 5 proposes a revised methodological approach for evolutionary economics, providing a critical analysis of the research conducted thus far. Finally, Section 6 brings the discussion to a conclusion.

2. Theoretical Origins of Evolutionary Economics

Nelson (2018) notes that many classical economists and social scientists were essentially cultural evolutionary theorists, proposing policy directions aimed at improving living standards and socioeconomic empowerment for less privileged social groups. Apart from this, evolutionary economics, as a field, traces its conceptual roots to early biological theories.

Jean-Baptiste Lamarck was a pioneering figure in evolutionary biology, proposing the idea that species adapt over time to their environments (Hodgson & Knudsen, 2006). Following Lamarck, Alfred Russel Wallace and Charles Darwin (1859) shaped the field of evolutionary biology by exploring the theory of evolution through natural selection. In sociology, Auguste Comte further advanced the intellectual background with his theories on social evolution and the importance of empirical observation in understanding the mutations of complex societal systems (Comte, 1848). Herbert Spencer applied Darwinian principles to societal structures, coining the phrase "survival of the fittest" (Spencer, 1864)—however, this phrase has frequently been misunderstood.

Subsequently, Thorstein Veblen laid the foundation for evolutionary economics with his critique of conventional economic theory and his emphasis on the role of institutional change and cultural evolution in economic development, notably through his concept of "conspicuous consumption" (Veblen, 1899).[1] Several years later, Kenneth Boulding further developed the field by introducing the evolutionary perspective into various aspects of socioeconomics, emphasizing the significance of systemic thinking, knowledge, technological progress, and the use of metaphors from biology to understand economic evolution and the dynamics of socioeconomic systems (Boulding, 1981).

Evolutionary economics comprises three primary theoretical "families," as identified by Kwasnicki (1999). The first, neo-Schumpeterian economics, is grounded in Joseph Schumpeter's work, which emphasizes the study of long-term economic development, innovation dynamics, and the

[1] According to Lawson (2002), Veblen's philosophical legacy is not merely deconstructive but fundamentally constructive, grounded in ontology rather than just epistemology. Veblen believed that economics inevitably would become an evolutionary science through a natural evolutionary process, independent of normative influences (Boland, 1991; Caplin & Schotter, 2008; Friedman, 1953; Holcombe, 1989; Mirowski, 1992; Schmid & Thompson, 1999). However, his prediction has not materialized as expected due to his specific version of evolutionary epistemology being disproven by subsequent developments in the field. Despite this, the author suggests that Veblen's normative perspective, which emphasizes a genetic process of cumulative causation, remains valuable.

role of the "Schumpeterian entrepreneur" in fostering progress and system discontinuity (Schumpeter, 1939, 1942, 1954). Schumpeter, influenced by Karl Marx and the German Historical School, offered a dynamic—and enduringly transformative through "revolutions"—economic perspective, distinct from the neoclassical focus on equilibrium. His concept of "creative destruction" highlighted the ongoing replacement of outdated production methods and societal structures with innovative alternatives, assigning an inherently evolutionary nature to capitalism. Schumpeter contended that capitalism, propelled by innovation and marked by perpetual evolutionary conflict, would inevitably evolve into socialism. This transition, he argued, would not align with Marxist theories but would result from escalating bureaucratic constraints.[2]

The second, the institutional school, originated with Thorstein Veblen (1898). Veblen suggested that evolutionary economics should concentrate on the "cumulative sequence of economic institutions," drawing on biological analogies to understand institutional evolution. This school, later represented by scholars like Clarence Ayres and John Commons, shifted towards "cultural determinism," moving away from Veblen's biological analogies (Samuels, 1977). Modern institutional economics, influenced by Oliver Williamson (1976) and Douglas North (1990), has seemingly reconnected with evolutionary economics towards a more open understanding of socioeconomic evolution.

The third, the Austrian school, was founded by Carl Menger (2007). It focuses on the formation of money and institutions from a perspective of subjective value creation. Figures like Friedrich Hayek (1988) and Ludwig von Mises (2007a, 2007b) underscored the evolutionary nature of institutions and the market economy. Hayek (1967) and Mises differentiated between biological and social evolution, with a particular emphasis on the role of individuals in society.

Nelson and Winter (1982) significantly contributed to modern evolutionary economics, challenging standard neoclassical growth theory and emphasizing the uncertain and complex nature of economic processes. They incorporated ideas from biology, advocating for concepts like evolving "organizational capabilities" and "routines" over traditional profit maximization theories. They also highlighted the relevance of the "Marshallian tradition" to evolutionary economics, with Alfred Marshall's (1890) assertion that economics should align more with economic biology than mechanics (Hodgson, 1993b). According to Roncaglia (2017), this tradition sought to apply the Darwinian evolutionary approach to economics, aligning Marshall's thought more closely with evolutionary economics than with neoclassical orthodoxy.

[2] Schumpeter regarded the bureaucratic shift not as a failure of capitalism, but rather as its evolutionary progression. He suggested that the efficiencies and organizational strengths inherent in large-scale production and administration would inevitably foster more centralized control, thereby setting the stage for a socialist economic framework. He identified three key institutional changes that would gradually steer capitalism toward a significant historical transition. Firstly, the importance of the entrepreneurial function and the entrepreneur's role would diminish, eventually being overtaken by salaried technocrats and bureaucrats at the helm of large, publicly traded corporations. Secondly, the disintegration of the protective social layers within the capitalist class, presumed unable to assume political leadership in a capitalist society or effectively safeguard their own class interests. Lastly, he highlighted the gradual erosion of the institutions of private property, freedom of transactions, and individual contracts, marking a pivotal shift in the economic landscape (Schumpeter, 1928, 1942).

In essence, as outlined by Chatzinikolaou and Vlados (2019), there are three high-level methodological criteria for defining evolutionary economics: 1) an explicit analytical connection between innovation dynamics and the transformative process of capitalist socioeconomic development, as suggested by Schumpeter (1942, pp. 82–83); 2) a rejection of mechanistic approaches to firms, favoring a "biological" and "ecosystemic" model that considers evolving "routines" and "organizational capabilities"; and 3) an integration of the socioeconomic development issue with the institutional perspective and the specific space-time context of socioeconomic actors, viewing institutions as historically evolving entities that can be understood through biological analogies.

3. The Evolutionary Macro-Meso-Micro Framework and its Research Applications

The macro-meso-micro synthesis potentially offers a significant theoretical viewpoint for further establishing methodological foundations in evolutionary economics. Rooted in evolutionary and institutional economics, the macro-meso-micro synthesis amalgamates diverse intellectual currents, challenging the conventional dichotomy between macroeconomics and microeconomics. Among others, Galbraith's (1987, pp. 295–297) neoinstitutional approach played a crucial role in underscoring the limitations of this dichotomy, especially in addressing "unemployment in the mature industrial countries."

Furthermore, the French and Italian schools of mesoeconomics represented pioneering efforts to apply Marshall's concept of industrial districts to the intermediate realm between microeconomics and macroeconomics, effectively constructing an analytical bridge between these two levels of economic analysis (Belussi & Caldari, 2008). In Italy, Becattini's (1979, 1990) rediscovery and elaboration of Marshall's notion of industrial districts highlighted the socioeconomic dynamics of localized industries, significantly contributing to the development of mesoeconomic theory. In France, the regulation theory, particularly the works of Boyer (1986) and the Regulation School (e.g., Aglietta, 1979), offered insights into how industrial structures and institutions evolve and interact within economies, providing a macroscopic backdrop to mesoeconomic phenomena.

Subsequent studies have explored various methods, yet often without explicitly integrating the macro, meso, and micro into a cohesive analysis of socioeconomic systems. Notably, Zezza and Llambí's (2002, p. 1881) research advocated for incorporating mesolevel and microlevel variables into macrolevel policymaking, proposing a framework to examine the interplay among these variables in specific contexts.

A significant advancement in macro-meso-micro theorization can be attributed to Dopfer et al. (2004, p. 69), who provided an interpretation of meso in economics, extending its scope beyond traditional market structure and industry cluster analysis. They reconceptualized meso from an ontological standpoint, identifying it as a crucial component of the economic system, encompassing industrial districts, regional knowledge clusters, and innovation systems. Particularly, they argued for an analytical framework in evolutionary economics with a macro-meso-micro structure, emphasizing the complex and emergent nature of economic evolution. In their words, "An economic system is a population of rules, a structure

of rules, and a process of rules... The proper analytical structure of evolutionary economics is in terms of micro-meso-macro" (Dopfer et al., 2004, p. 263).

Mirzanti et al. (2015, p. 407) shed light on the roles of individual entrepreneurs, organizations, and broader economic forces across the macro, meso, and micro, identifying key conditions for entrepreneurial success. Bolíbar (2016) advocated for using "social network analysis" as a bridging tool that integrates the macro, meso, and micro by understanding social networks as intermediary structures shaped by individual interactions, thereby influencing broader social structures. Peneder (2017, pp. 834–835) expanded this discourse, arguing for integrated industrial policies that enhance systemic competitiveness, necessitating synergy across micro, meso, and macro. Barbour (2017, p. 10) highlighted the challenges and opportunities in multilevel research, proposing innovative methods like ambient data collection and computational social science tools for analyzing communication patterns across different levels. Serpa and Ferreira (2019, p. 123) concluded that the mesosocial level, often seen as mobilized by focusing mainly on groups or organizations, serves as an intermediate bridge between the other levels of analysis. Serpa and Ferreira (2019) asserted that the mesolevel only has heuristic value in interpreting a given social context if the microsocial and macrosocial levels are not neglected.

More recently, Vlados and Chatzinikolaou (2020b, 2020a) introduced the "competitiveness web" concept, envisioning an ecosystem of interactions that integrates firms, sectors, and economies into a unified, adaptive entity facing global competitive pressures. This concept outlines policy initiatives tailored to each level: microlevel policies for firm-specific advancements, mesolevel efforts for regional innovation, and macrolevel initiatives for broader economic and societal reforms. Table 1 outlines several options for focusing on the study of these levels.

Table 1. Varied Levels of Macro, Meso, and Micro, adapted from Chatzinikolaou et al. (2021)

Socioeconomic Level	Description
Macro	Encompasses the broad business and socioeconomic context, in its aggregate and total contour, including national, international, or supranational scopes—e.g., international political economy is a relevant study area
Meso	Involves particular sectors, industry clusters, or business ecosystems
Micro	Pertains to individual companies and market participants—it is analogous to the biological emphasis on the cell[3]
Macro-Meso	Represents the conventional perspective on regional economic growth

[3] The macro-meso-micro framework in evolutionary economics, akin to the holistic unity found in biological ecosystems, highlights the pivotal role of the microlevel. It stresses the essential influence of individual behaviors and microcomponents in determining the course of socioeconomic evolution, mirroring the significant effect individual organisms have on their ecosystems (Hammerstein & Hagen, 2005; Parisot, 2013). This comparison sheds light on the interconnected nature of economic systems, demonstrating how actions and decisions at the microlevel propel changes within mesolevel organizations and shape macropatterns. This underscores the importance of a comprehensive analysis across these levels to fully understand the intricacies of evolutionary processes in economics.

Socioeconomic Level	Description
Macro-Micro	Indicates how macroeconomic stability and growth bolster and refine the overall business climate
Meso-Micro	An intermediate environment that includes entities fostering specific business models across diverse locations and sectors—the topic is covered by study areas such as local innovation systems
Macro-Meso-Micro	A comprehensive view of long-term socioeconomic development resulting from interactions across multiple levels

The macro-meso-micro analysis within evolutionary economics significantly deepens our comprehension of socioeconomic development by stressing the importance of considering all participating levels. This approach brings unity and coherence to the evaluation and resolution of economic phenomena and their issues through the application of pertinent policies—it enhances clarity and effectiveness in identifying and addressing economic challenges and their solutions. Additionally, it stands in contrast to more traditional neoclassical growth models, which often suggest that growth is predominantly influenced by macrofactors (cf. Kober et al., 2016; Weeks, 2012), mesofactors (cf. Menzel & Teubner, 2020; Pysar, 2017), or occasionally, entrepreneurial microfactors (Barreto, 2013; Ekelund & Hébert, 2002). These views tend to blur the distinction between growth and development (Vlados, 2020), and minimize the social and structural dimensions, favoring a rather limited positivist approach focused on "pure" economic flows.

However, evolutionary economics offers—and indeed demands—a different perspective that views development as emerging from interactions among various interdependent socioeconomic levels—apparently greatly strengthened by adopting critical realism. This viewpoint, which we propose to integrate more fully into an enriched evolutionary economics framework in the next section, underscores the importance of concurrently examining macro-meso-micro socioeconomic structures and dynamics, rather than isolating them or narrowly focusing on just one or two (e.g., Behmiri et al., 2019; Benos et al., 2015).

4. Examining Ontological and Epistemological Aspects of Evolutionary Economics: Why Critical Realism

Evolutionary economics, a field distinct in its principles, research priorities, and processes, diverges markedly from conventional economic theories of neoclassical origin. At its core, evolutionary economics rejects the static assumptions of perpetual equilibrium and absolutely rational actors,[4] prevalent in standard economics, and instead embraces a dynamic perspective, drawing parallels with biological and ecosystemic processes

[4] Of course, we acknowledge the existence of microeconomic models that incorporate irrational actors (e.g., Acemoglu, 1998; Hart, 1975).

like variation, selection, and adaptation.[5] This approach illuminates the evolving nature of economies, particularly in response to technological advancements and shifting market conditions, while also considering broader changes in the socioeconomic context. The question of whether this represents a paradigm shift in the Kuhnian sense (Kuhn, 1962) continues to be debated (Dopfer & Potts, 2004). While evolutionary economics has gained significant influence over the recent past, it coexists with, rather than replaces, other economic paradigms and theoretical approaches.

Some efforts have been made in the recent past to clarify the ontological and epistemological foundations of evolutionary economics from a philosophical perspective, building on its existing foundations. Notable among these is the work of Dopfer and Potts (2004, p. 195), who observed a resurgence in evolutionary economics, emphasizing its interdisciplinary nature. They proposed "evolutionary realism" based on axioms such as the bimodal matter-energy actualization, the associative and processual nature of existences, and advocated for a comprehensive analytical framework spanning micro, meso, and macro. Klaes (2004, p. 359) described evolutionary economics as a field of influential but nebulous definition, suggesting it be understood as a social institution under a "meaning finitist" lens. Vromen (2004, p. 213) stressed the heuristic rather than definitive role of ontological considerations in this field, addressing misconceptions regarding Darwinian processes in capitalist economies.

Nishibe (2006) aimed to redefine evolutionary economics by distinguishing its unique features in opposition to neoclassical economics by emphasizing the view of the market as an autopoietic, self-organizing system rather than one that is centrally planned or designed. Nishibe (2006) explored evolutionary economics through an ontological and epistemological lens, emphasizing its relevance in analyzing large-scale, complex, and uncertain economic systems, which rely on social institutions like conventions and routines to operate. Nishibe (2006) introduced an "analogical-evolutionary pluralist" approach and positioned evolutionary economics within a broader metaeconomic context that considers interactions between economics and other scientific disciplines. Geisendorf (2009, p. 377) addressed the debate on whether principles like variation, selection, and retention are universally applicable in economic evolution, advocating for a balanced view that includes the concept of self-organization.

While these approaches in the foundations of evolutionary economics are interesting, there appears to be room for further enrichment. We suggest that the philosophical foundations of evolutionary economics appear to align closely with critical realism, despite its emergence significantly after the development of evolutionary economics (Lawson, 1998). In particular, critical realism was developed in

[5] As noted in the preceding footnote, neoclassical economics certainly encompasses dynamic models featuring unstable equilibria. A consistent feature of neoclassical economics is its reliance on marginal analysis and, to a lesser extent, mathematical reasoning—though not invariably, as illustrated by Fischer Black's concept of "Noise" (Black, 1986). It's important to acknowledge that our critique targets aspects of standard-conventional neoclassical theory that have been incrementally moderated and circumvented in the broader neoclassical discourse (Barro, 1997; Vlados, 2019).

the works of Bhaskar (1975, 1979, 1993)[6] and others (Archer, 1995; Collier, 1994; Lawson, 1997; Sayer, 1992), offering a sophisticated critique of both positivism and constructivism (Schmid & Thompson, 1999).

Critical realism challenges the positivist reduction of reality to empirical observations and the constructivist limitation of reality to human knowledge (Fletcher, 2017). This philosophy navigates beyond the objectivity-subjectivity dichotomy, focusing on the interplay between ontology—what exists—and epistemology—what is known.[7]

In critical realism,[8] reality is conceptualized as having three dialectically defined strata (Bhaskar, 1993): first, the empirical, concerning observable phenomena, second, the actual, which are events irrespective of observation, and third, the real, conceptualizing the underlying causal mechanisms. This framework aims to elucidate social events through their causal mechanisms, emphasizing the "why" over the "what" of occurrences (Cassell et al., 2017).

Critical realism, as a social science philosophy, is applicable across various empirical fields and spatiotemporal contexts,

[6] The main critique of Bhaskar (1975, p. xxx) and the reason behind advocating for a critical realist view reads as follows: *"This book is written in the context of vigorous critical activity in the philosophy of science. In the course of this the twin templates of the positivist view of science, viz. the ideas that science has a certain base and a deductive structure, have been subjected to damaging attack. With a degree of arbitrariness one can separate this critical activity into two strands. The first, represented by writers such as Kuhn, Popper, Lakatos, Feyerabend, Toulmin, Polanyi and Ravetz, emphasises the social character of science and focusses particularly on the phenomena of scientific change and development. It is generally critical of any monistic interpretation of scientific development, of the kind characteristic of empiricist historiography and implicit in any doctrine of the foundations of knowledge. The second strand, represented by the work of Scriven, Hanson, Hesse and Harré among others, calls attention to the stratification of science. It stresses the difference between explanation and prediction and emphasises the role played by models in scientific thought. It is highly critical of the deductivist view of the structure of scientific theories, and more generally of any exclusively formal account of science. This study attempts to synthesise these two critical strands; and to show in particular why and how the realism presupposed by the first strand must be extended to cover the objects of scientific thought postulated by the second strand. In this way I will be describing the nature and the development of what has been hailed as the 'Copernican Revolution' in the philosophy of science."*

[7] Quoting Bhaskar (1975, pp. xxx–xxxi) again: *"To see science as a social activity, and as structured and discriminating in its thought, constitutes a significant step in our understanding of science. But, I shall argue, without the support of a revised ontology, and in particular a conception of the world as stratified and differentiated too, it is impossible to steer clear of the Scylla of holding the structure dispensable in the long run (back to empiricism) without being pulled into the Charybdis of justifying it exlusively in terms of the fixed or changing needs of the scientific community (a form of neoKantian pragmatism exemplified by e.g. Toulmin and Kuhn). In this study I attempt to show how such a revised ontology is in fact presupposed by the social activity of science. The basic principle of realist philosophy of science, viz. that perception gives us access to things and experimental activity access to structures that exist independently of us, is very simple. Yet the full working out of this principle implies a radical account of the nature of causal laws, viz. as expressing tendencies of things, not conjunctions of events. And it implies that a constant conjunction of events is no more a necessary than a sufficient condition for a causal law."*

[8] Critical realism must not be confused with scientific realism. Here is a relevant quote that potentially illustrates their differences (Andrikopoulos, 2012, p. 342): *"Nevertheless, this does not mean that the models cannot be true. Scientific realism in finance is about what it is for a model to be true and requires that the model is causally independent from the financial phenomenon it aims to explain (e.g. that the relation between risk and return in the market for capital assets is not brought into existence as a result of a model that explains such an existence)."*

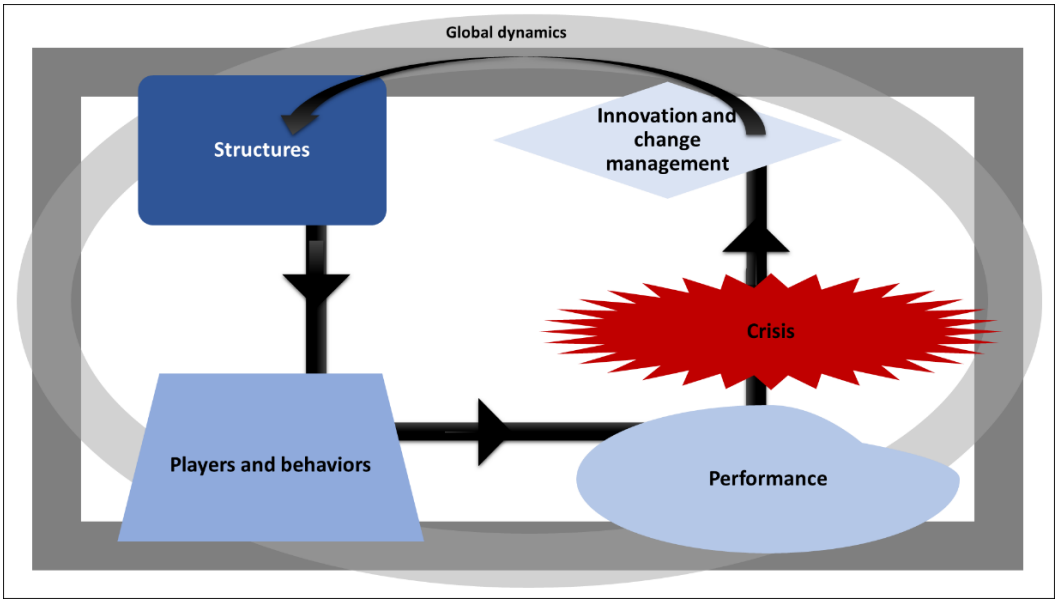

Figure 1. Critical Realism and Socioeconomic Development

in contrast to positivism, which is limited to strictly measurable experiential realms. In this vein, we suggest that innovation serves as a causal mechanism in the developmental hierarchy of capitalism (Figure 1).

Since Schumpeter's (1942) analysis, capitalism has been acknowledged as a socioeconomic system in constant transformation, continuously revolutionized by the forces of innovation. Schumpeter's notion of "creative destruction," characterized by "gales of innovative change," illustrates how capitalism propels older industries into obsolescence while nurturing new ones. In this context, Schumpeter is arguably the foremost precursor to modern evolutionary economics, which can be viewed as a natural extension of classical political economy rather than a derivative of neoclassical economics.

We propose that socioeconomic development, from an ontological perspective at the "real level," originates from capitalist institutions that act as "structures." These structures undergo modification at the "actual level" through the actions of various "players," whose continual redefinition of global-regional-local systems leads to inevitable evolutionary-structural crises. These crises can be resolved through effective innovation and change management (Chatzinikolaou & Vlados, 2022; Vlados et al., 2018). Therefore, critical realism seems to be the most fitting philosophical framework for evolutionary economics: Its layered approach, emphasizing causal mechanisms, aligns effectively with the dynamics of capitalist institutions, distinguishing it from other approaches such as positivism.

In summary, evolutionary economics appears well-suited to incorporate critical realism because this theory starts from the ontological viewpoint that the emergent properties of socioeconomic systems, as interpreted through critical realism, offer a profound understanding of institutional and innovation dynamics in evolutionary

economics (Adamides, 2018). As mentioned above, this process involves recognizing and examining how macro-meso-micro socioeconomic structures impact and limit economic actors and activities. On the epistemological front, critical realism focuses on a thorough comprehension of causality, which extends beyond simple correlations (Pratten, 2009). It motivates researchers to identify the underlying mechanisms responsible for observable phenomena. In evolutionary economics, as previously argued, this is essential for comprehending how certain economic behaviors, patterns, or structures come into existence and change over time due to specific economic mechanisms such as innovation. Moreover, critical realism potentially strengthens evolutionary economics by embracing complexity (Robert et al., 2017; Törnberg, 2018), incorporating various methods as we will demonstrate, emphasizing historical context (Filho, 2020; Nelson et al., 2018), and contesting models based on a conventionally understood positivist reductionism (Carolan, 2005; Schmid & Thompson, 1999).

Nonetheless, the methodological underpinnings of evolutionary economics, when viewed through the lens of critical realism, are somewhat ambiguous, lacking a clear structure, and remain relatively underexplored in contemporary scholarly discussions. The subsequent section endeavors to elucidate some of these aspects.

5. Introducing a Restructured Methodological Orientation for Evolutionary Economics

As we discussed, evolutionary economics has faced criticism for its somewhat vague methodology, despite Nelson and Winter's (1982) seminal work, which introduced a novel method of economic inquiry. In particular, they proposed integrating quantitative and qualitative techniques, advocating for computer-based simulations in evolutionary economics. These simulations, supposed to blend numerical data and algorithms, aimed to explore market behaviors, competition, and the evolution of business strategies. Nelson and Winter (1982) also incorporated biological concepts like variation and selection to interpret these simulations, providing insights into economic dynamics and policy impacts. Their approach, combining data-driven simulation with conceptual analysis, represented a significant shift from traditional economic models by highlighting the non-linear and evolving nature of economic systems.

Modern evolutionary economics (Nelson et al., 2018) has faced criticism for its qualitative nature and speculative approach, which pose challenges for empirical validation. A key issue is its foundation on the concept of bounded rationality (Cyert & March, 1963; March & Simon, 1958; Simon, 1957), which leads to difficulties in operationalizing and testing evolutionary hypotheses due to vague definitions and the absence of measurable variables. This reliance on qualitative data, such as historical and anecdotal evidence, is prone to interpretative biases and variability (Hodgson, 1993a; Witt, 2003). Furthermore, the evolutionary perspective, with its emphasis on gradual change, may fail to account for swift economic transformations and crises (Foster, 1997). Additionally, there is a noted deficiency in evolutionary economics' lack of a comprehensive approach that integrates macro, meso, and micro, often resulting in a focus on macroeconomic developments (cf. Bell & Figueiredo, 2012; Kim, 1997; Lall, 1992; Lee, 2019; Lee & Temesgen, 2009;

Malerba & Lee, 2021). Nelson (2020) criticizes this narrow focus, particularly its limited attention to technological advancements at the expense of other forms of innovation, such as market, organizational, and financial innovations, which are also crucial according to Schumpeter.

However, the future of evolutionary economics appears promising, with suggestions for exploring stochastic models and economic experiments involving both simulations and real participants (Japan Association for Evolutionary Economics & Aruka, 2001). This field also encourages the incorporation of diverse philosophical and critical perspectives, advocating for a more inclusive and heterodox approach to economic theory (Japan Association for Evolutionary Economics & Aruka, 2001). Hodgson (2001) emphasizes the need for evolutionary economics to embrace novelty, resist reductionism, and adopt a broad conception of change, highlighting the importance of acknowledging emergent properties.

Nelson (2020) suggests that evolutionary economists should expand their analytical framework to cover a broader array of innovations, not just technological ones. This includes a greater focus on the demand side of innovation, exploring non-manufacturing sectors, and recognizing the influence of government programs and regulations on economic developments.

Therefore, despite its criticisms, evolutionary economics is widely regarded among scholars for understanding the dynamics of change and innovation within economies (Nelson, 2020). However, to enhance its empirical robustness and theoretical foundation, it must address its methodological and conceptual shortcomings. Incorporating the "research onion" model proposed by Saunders et al. (2019) could provide a structured methodological framework to strengthen evolutionary economics

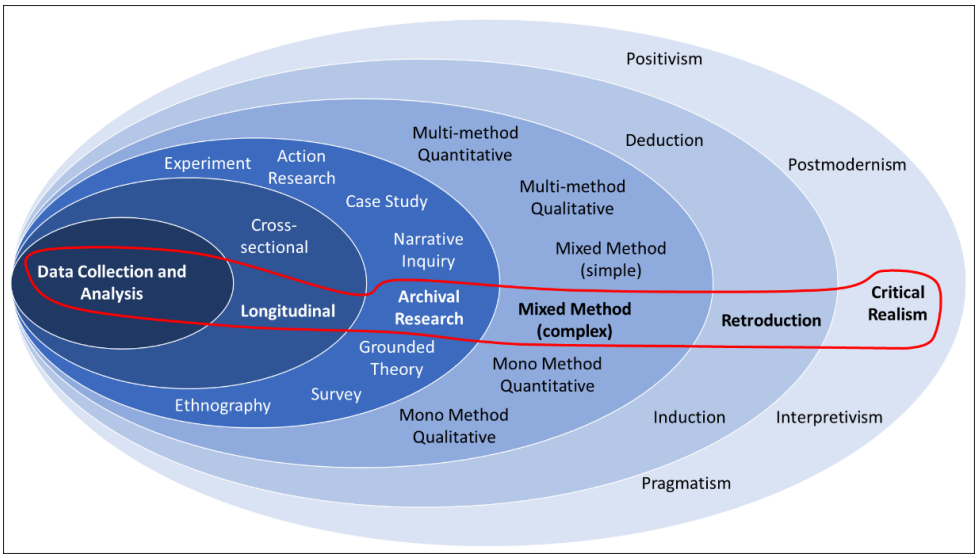

Figure 2. A Seemingly Enhanced Methodological Orientation for Evolutionary Economics, Adapted from Saunders et al. (2019)

research (Figure 2). This model suggests a layered process starting from philosophical underpinnings: positivism, postmodernism, critical realism, interpretivism, pragmatism; to theory development approaches: deduction, retroduction, induction; methodological choices: quantitative/qualitative multi-methods, mixed methods, mono methods; research strategies: experiments, case studies, archival research, etc.), time horizons (cross-sectional or longitudinal; and techniques for data collection and analysis.

We propose that enriched research in evolutionary economics should minimally include critical realism, retroduction, a combination of methods, archival research, a longitudinal time horizon, and comprehensive data collection and analysis. The rationale for this recommendation is as follows:

- Selecting and assimilating the critical realist perspective: Table 2, modifying Saunders et al. (2019), contrasts various philosophical approaches in economics and business research. The stratified ontology of critical realism, as discussed earlier, is apparently essential for addressing the evolutionary macro-meso-micro framework.

Table 2. Philosophical Approaches in Economics and Business Research, based on Saunders et al. (2019)

Philosophy	Ontology	Epistemology	Contribution	Axiology	Basic methods
Positivism	Recognizes a singular reality governed by order and independence — universalism	Employs scientific methods focusing on observable, measurable facts and law-like generalizations	Facilitates understanding of causality and prediction	Advocates for a value-free, objective, and neutral stance	Utilizes deduction, large samples, structured approaches, and emphasizes measurement and quantification
Interpretivism	Acknowledges complexity and multiple interpretations within social constructs	Theorizes based on narratives, perceptions, and interpretations	Offers new understandings or worldviews	Involves value-bound, objective stance, and reflexivity	Involves inductive reasoning, small samples, in-depth examination, and qualitative methods
Postmodernism	Denies objective knowledge, highlighting complexity and the dominance of certain interpretations or realities	Views truth and knowledge as relative, shaped by dominant ideologies, with a focus on marginalized interpretations	Aims to reveal power relations and challenge existing paradigms	Embeds value-constitution and power relations, advocating for radical reflexivity	Employs deconstruction, deep examination of anomalies, typically using qualitative methods
Pragmatism	Reality is defined by the practical consequences of ideas, acknowledging complexity	Values knowledge in specific contexts, considering theories true if they enable successful action	Focuses on problem-solving and generating actionable future practices	Driven by values and research beliefs, emphasizing reflexivity	Methods are defined by research problems and questions, including mixed, multiple, quantitative, and action research, with a focus on practical solutions
Critical realism	Emphasizes stratification—empirical-actual-real—and causal mechanisms, with a non-transient nature	Supports epistemological relativism, viewing knowledge as historically shaped and transient, and facts as social structures	Focuses on historical causality	Values laden, understanding bias limitations, and seeks the most objective judgment possible	Uses retroduction, in-depth and historical analysis of structures, and various methods fitting the subject matter

Table 3. Fundamental Inference Paths in Theory Development, adapted from Danermark et al. (2002, p. 80)

	Deduction	Induction	Retroduction
Inference path	Logical conclusions derived from given premises	Generalized conclusions about populations based on specific subject observations	Restructures phenomena based on primary conditions
Generalizability	From general to specific	From specific to general	Involves general-specific and specific-general interactions
Formal structure	Yes	Yes	Yes and no
Limitations	Conclusions are limited to the premises; doesn't inform about external realities	Conclusions lack empirical certainty—an internal limit—and are bound to empirical reality — an external limit	No fixed criteria for validating retroductive conclusions
Example	If premise states A leads to B, then A invariably results in B	Research on a representative sample of golf-playing individuals concludes golf is popular among the elderly	Karl Marx's reinterpretation of human history through the lens of historical materialism

- Recognizing the value of retroduction: Table 3, adapted from Danermark et al. (2002, p. 80), illustrates why retroduction is a fundamental approach for evolutionary theory development. Marx's reinterpretation of human history through historical materialism (Giddens, 1995) exemplifies a retroductive approach, restructuring existing knowledge of capitalist development based on underlying causal mechanisms, such as the law of the tendency of the falling profit rate.[9] It's important to note the distinct challenge in combining critical realism with postmodernism; while postmodernists primarily offer high-level critiques without proposing alternatives, Marx, as an evolutionary economist, grounded his theories in the hypothesis of historical materialism.[10]
- Mixing all methods: Considering the generalizability of retroduction, which involves a general-specific and specific-general interplay (Table 3), all methods in their coadaptation are viable. Evolutionary economics can employ qualitative research, with its inductive-subjective-contextual focus, and quantitative research, which emphasizes a deductive-objective-generalizing approach (Lingard et al., 2008, p. 3), as well as various mixed methods (Creswell & Creswell, 2018, p. 41).
- Systematic and in-depth archival research: As a minimum requirement, archival research is indispensable in evolutionary economics, given the necessity of exploring deeper and historical causal factors in capitalist structures (Table 2).
- Longitudinal examination horizon: Given the archival nature of research in evolutionary

[9] The alignment of this method with critical realism is, however, debated (Hodgson, 2004).

[10] In the realm of economics, postmodernism is less about presenting a cohesive theory of economic systems and more about deconstructing the assumptions and certainties of economic science. It questions the objectivity of economic analyses and argues that economic realities are socially constructed, influenced by language, culture, and power structures. This approach leads to a critical examination of economic policies, practices, and discourses, highlighting how they reflect and perpetuate power imbalances (Harvey, 1989; Jameson, 1991).

economics, a longitudinal time horizon is a fundamental requirement—moving beyond superficial interpretations and misconceptions driven by circumstantial data.

- Systematic data collection and analysis: Techniques and procedures for data collection and analysis in evolutionary economics should be as comprehensive as necessary to meet the research objectives set at the outset.

As previously discussed, evolutionary economics investigates the evolution of institutional frameworks and the dynamics of innovation and uses biological analogies. Changes in institutional frameworks are examined at the macrolevel, where institutions are recognized as lasting structures and entities that shape societal norms and behaviors (Acemoglu & Robinson, 2012; North, 1990). The examination of the dynamics of innovation is primarily linked to the mesolevel, focusing on the unique relationships within individual socioeconomic environments and the interactions fostered between both macrolevels and mesolevels (Adner & Kapoor, 2010). The application of biological analogies is connected to the microlevel, employing concepts from biology to comprehend how entities adapt and evolve under the pressures of natural selection (Chatzinikolaou & Vlados, 2019; Foster, 1997), while acknowledging the constraints in directly transferring these analogies from biology to social sciences (Cordes, 2006; Witt, 1996).

We recommend analyzing these aspects through the lens of critical realism and, for empirical substantiation, following the prerequisite guidelines outlined in this paper—along with any other chosen methodological route. Practical examples of this study's framework, although scarce and relatively recent in scholarly discussions, are evident in certain studies highlighted in the section detailing the macro-meso-micro framework (e.g., Chatzinikolaou et al., 2021; Dopfer et al., 2004; Peneder, 2017).

In brief, the foundational methodological requirements for evolutionary economics should at least encompass critical realism, retroduction, a diverse array of methods, archival research, and a longitudinal approach. While these elements form a basic path, additional complementary methodologies may be employed to fulfill the specific goals of evolutionary economics research.

Conclusion

This paper has embarked on an exploration of a redefined and enriched theoretical framework for evolutionary economics. It has been demonstrated that the field of evolutionary economics is built upon four fundamental dimensions that constitute its core. Firstly, at the level of theoretical development, evolutionary economics typically relies on the triad of innovation dynamics, biological interpretation, and continuous transformation of institutions. Secondly, it has been shown that evolutionary economics can adopt a holistic macro-meso-micro perspective, with a special emphasis on the microlevel as the epicenter of the socioeconomic system under scrutiny. Thirdly, critical realism has been identified as the most suitable philosophical foundation for this field, due to its emphasis on causal mechanisms and alignment with the dynamics of capitalist institutions, setting evolutionary economics apart from other economic theories like positivism and postmodernism (Figure 3).

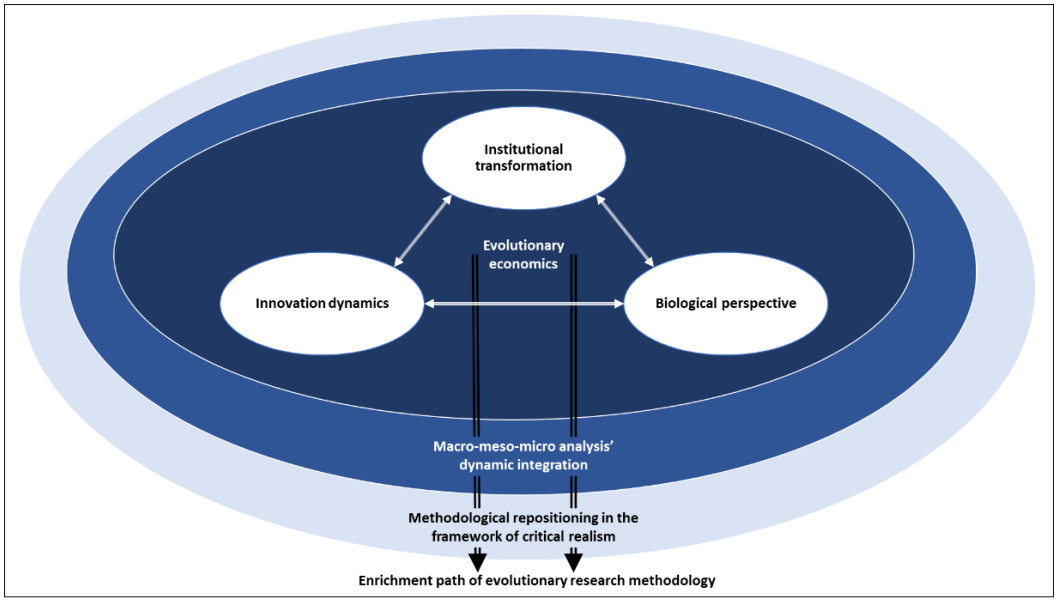

Figure 3. The Proposed Schema for Enriching Evolutionary Economics' Methodology

Fourthly, we argue that the methodological foundations of evolutionary economics can be significantly strengthened by adopting the critical realist perspective, which includes the appreciation of retroduction, the integration of diverse methods, thorough and systematic archival research, a longitudinal study approach, and meticulous data collection and analysis.

It becomes apparent that evolutionary economics has yet to make significant progress in its methodological foundations since Nelson and Winter's (1982) seminal work. This field could be substantially improved in the future. Our study potentially contributes by emphasizing critical realism and elucidating the relevance of diverse methodologies within evolutionary economics. The field, often perceived as vague (Klaes, 2004), likely attains more clarity when viewed through a Kuhnian paradigm (Kuhn, 1962). This perspective sets it apart from conventional neoclassical economics, which typically lacks a thorough approach to historical causality, especially in terms of socioeconomic and institutional dynamics.

In conclusion, this paper emphasizes the importance of further justifying and operationalizing the four dimensions recognized in evolutionary economics. It also points out the need for more case studies and analyses in various sectors, as well as additional research within this field, to strengthen the established dimensions and broaden the comprehension and impact of evolutionary economics.

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