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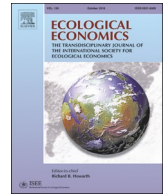
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Methodological and ideological options

Keeping multiple antennae up: Coevolutionary foundations for methodological pluralism

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ABSTRACT

Methodological pluralism has been a tenet of ecological economics since the journal's inauguration. Pluralism has fostered collaboration and forged new insights across disciplines. However, to counter the hegemonic voice of mainstream economics and inspire action on climate change and inequality, ecological economics requires coherence to produce meaningful knowledge from diverse research findings. This has to be done in a world that is increasingly complex and rapidly changing. In this article, we argue that ecological economists should keep multiple antennae up to foresee and respond to the uncertainties of rapid change. Methodological pluralism facilitates diversity of thought, which scholars require in times of rapid change. Responding to previous critiques that methodological pluralism lacks philosophical foundation, we offer tentative conceptual and historical foundations. We ground our understanding of reality and how we partially know that reality in coevolutionary thinking. We illustrate how economic beliefs (Economism), economic knowledge (episteme), and social-economic reality coevolve together with nature to produce the current era—the Econocene. Our historical tale of the Econocene illuminates how the economic-centric beliefs guiding public and academic knowledge reproduce unsustainable and inequitable outcomes. Ecological economists, we argue, should support guiding beliefs centered on the biosphere, equity, and care while practicing a structured pluralism.

1. Introduction

In the first issue of the first volume of *Ecological Economics*, Norgaard (1989) made “The Case for Methodological Pluralism”. The article refined a paper presented to one of the earliest international ecological economics workshops held in Barcelona two years prior. Grounded in coevolutionary thinking, the paper reframed the mounting human-environment challenge. The fundamental problem, Norgaard (1989) argued, was one of modern society's knowledge, social organization, and technological systems not fitting with, and consequently being detrimental to, the diversity and dynamics of ecological systems. Coevolutionary thinking challenged over-simplified, deterministic explanations of sustainability crises.

Coevolution is not a normative concept—it aims to describe how interdependent systems evolve and causally influence each other (Kallis and Norgaard, 2010). A coevolutionary perspective recognizes that different ways of knowing are always partial and coevolving. From this epistemological position, understanding complex, coevolutionary systems can only be a collective endeavor that accommodates different

ways of seeing. Coevolution leads also to a (normative, or a priori) appreciation of diversity, including methodological diversity, as good, because diversity sustains evolutionary possibilities. Through variety, balance, and disparity among elements in social-ecological systems, diversity contributes to system resilience and adaptability (Kotschy et al., 2015; Elmqvist et al., 2003).

Pluralism supports an open scholarly society. For ecological economics, pluralism has largely fostered intellectual and activist exchange by providing space for neoclassical and heterodox economists, philosophers, and ecologists using different frameworks. Scholars from once colonizer and colonized nations have joined in a fertile conversation about how to interpret and resist the exploitation of people and the planet. While pluralism as a scholarly norm was indeed part of the vision of the 1989 article, “The Case” argued for methodological pluralism for a different, but complementary reason.

Methodological pluralism is necessary to understand complex social-ecological systems given the fragmented science that we have. Clear thinking, as understood at least since Descartes, requires well defined assumptions about pre-defined parts and a pre-defined way in

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which the parts interact. The problem is that science consists of many ways of being methodical. Science has multiple sets of clear assumptions about pre-defined parts and of the ways in which they interact. Any single scientific framework for looking at the complexities of social systems or ecological systems, let alone their coevolutionary interactions, only allows the observer to see those parts and the interactions that the framework pre-identifies. Ecology, for example, has many different ways of seeing, each with limitations. Predator-prey models only look at a specific relationship within a food web of an ecosystem. Basic food web models, in order to portray the whole ecosystem, use fixed coefficients that ignore the dynamics of predator-prey interactions. Energetics models of ecosystems do not allow an observer to see coevolutionary dynamics over time. An individual ecologist might undertake research using one or two theories for a whole career. This is entirely valid within the assumptions of the pre-defined framework, and most ecologists are quite aware of the different implications of ecology's different frameworks.

The situation is similar in economics, except that economists are less open than ecologists to acknowledging the plurality of their ways of knowing. Partial equilibrium market models demonstrate the efficiency of a competitive market, while general equilibrium theory stresses that there are many possible market constructs with efficient solutions depending on the distribution of rights among people to land, capital, and education. Economists also have macroeconomic models and monetary theories. More recently, game theory, evolutionary thinking, and behavioral economics have emerged, drawing on psychology and other fields. There are also strong traditions of economic thought stemming from Marx and institutionalism, though mainstream economists largely ignore these traditions. Neither ecological nor economic theory is unified, and thus neither is our understanding of their interactions. Advocating a single correct framework for ecological economics would require ecological economists to ignore much of ecological and economic understanding.

The belief in the eventual unity of knowledge seems to help scientists and economists to ignore the problems of fragmentation. The unity belief remains strong in the sciences, especially the physical sciences. The trend in the sciences since the Enlightenment, however, has been toward ever increasing fragmentation, toward systemic “endarkenment”, not enlightenment (Millgram, 2015). Methodological pluralism is not ideal, but it is where science, including ecological economics, is. Methodological pluralism characterizes how humans come to know and understand, collectively. Methodological pluralism, then, is first and foremost a humble perspective regarding how we can begin to ‘know’ complex, coevolutionary systems.

During the early years of the International Society for Ecological Economics, the pluralism article was frequently cited as characterizing a feature of the field. Indeed, a decade and a half later, the article was among the most cited *Ecological Economics* articles (Costanza et al., 2004). More recently, however, fundamental critiques of methodological pluralism have emerged (see Spash, 2012, 2015). Ecological economists have struggled to define both their collective identity and the related issue of the best way to put into effect a politics of environmental sustainability and social justice. For this, methodological pluralism has not been helpful. Both the need for identity and for an effective political strategy require some methodological closure, not openness. Uniting around a way of thinking and overthrowing the dominant political economy with a superior one is—as of now—incompatible with being mindful of the knowledge gaps, epistemological vagaries, and clear contradictions highlighted by methodological pluralism.

In a series of well-reasoned contributions, Clive Spash (2012, 2015) makes a case against the type of pluralism advocated in the 1989 article for: i) lacking an epistemological foundation, ii) not distinguishing

adequately between ontology, epistemology and methodology, and iii) keeping neoclassical economics within the methodological pluralism of ecological economics. Spash accordingly advocates a ‘structured pluralism’ with a restricted ontological and epistemological basis. His preference is that of critical realism. If we are to develop a strong, coherent field, Spash claims, we should impose stricter standards of what is and what is not ecological economics - ‘not anything goes’.

In this essay, we renew and refine the case for methodological pluralism, hopefully addressing and incorporating Spash's core concerns. We argue that methodological pluralism should continue as the basis for future research in ecological economics. Motivated by the great uncertainty of a rapidly changing climate and ever-increasing social inequality, we seek to clarify the relevance of methodological pluralism, given a foundational meta-framework of coevolution (Kallis and Norgaard, 2010). To do so, we provide a sharper analysis of the current moment – what we call ‘the Econocene’ – and the obstacles and opportunities it poses for an “ecological economics movement” (Spash, 2013).

We proceed as follows. Section 2 defines the core terms used in our analysis: doxa, episteme, economism and the Econocene. Section 3 tells a coevolutionary tale of how the Econocene became dominant, while Section 4 offers a diagnosis of where we currently stand and the role ecological economics has to play. Section 5 refines the case for methodological pluralism and Section 6 concludes.

We argue that plurality in science and knowledge production is even more important in this age of rapid social-ecological change than it was when Norgaard made the original case three decades ago. Foreseeing and responding to change in complex systems requires keeping multiple methodological antennae up. Understanding or predicting how coevolving systems change requires more than linear or mechanistic thinking allows. Understanding complex adaptive systems—by embracing uncertainty, non-linearity, and surprise—along with learning and experimentation, are desirable features for resilience, defined as the capacity to withstand change, adapt, and transform toward sustainability (Biggs et al., 2015; Folke et al., 2016). Evidence also supports diversity, reflexivity, and flexibility as key elements of managing and responding to complexity both in high pressure-environments (Nelson, 2008) and on the path toward sustainable transitions (Westley et al., 2013; Moore et al., 2018).

At the same time, new, shared public beliefs, what we call ‘doxa’, are essential if society is to mitigate harmful drivers of social-ecological change and adapt to their consequences in an equitable way. Ecological economics can do better to promote methodological pluralism and an ecological-economics doxa. Such doxa can be driven primarily by a commitment to sustainability and social equity, recognizing their relationality, without being imperialistic nor Anglo and Northern-centric. The coherence that the ecological economics community seeks may be found in a deeper understanding of the social need for doxa, and the epistemic importance of pluralism in today's Econocene.

2. Conceptual framework and core terms

In this section we present a conceptual framework to describe the relationship between beliefs (doxa), ways of knowing (episteme), and social reality. Framing the social world this way allows us to describe contemporary economic realities. Current economic doxa (economism) and episteme (economic theory) are interrelated and shape/are shaped by social reality (the Econocene). These systems are of course embedded in and coevolving with nature. By understanding how this economic-social system coevolves with nature to produce the current conundrums, we can partially parse the complexity and emphasize where ecological economists have a role in keeping an open scholarly society.

Doxa refers to the unquestioned beliefs, opinions, and generally shared knowledge in society (what Antonio Gramsci called ‘the common sense’ – see D’Alisa and Kallis, 2016, Kallis, 2018). *Doxa*, or common senses, are fundamentally many. In any given moment, there are a variety of them in a society, but some become hegemonic. We choose to use an old Greek word because it is rich in meanings and rife with contradictions. *Doxa* informs day-to-day personal choices and community practices. *Doxa* is sustained by discourse within the family, community, religious institutions, social imaginaries and public life. It appears in culture and art, dance, literature, and music. *Doxa*, in turn sustains the structure and operation of family, community, religion, and public institutions.

This mutuality between social beliefs and the maintenance and operation of social structures is critical to our argument. *Doxa* is an open term that reminds us that beliefs are necessary, contradictory, and glorious: common beliefs, discourses, social structure, and how we know are intertwined—one co-evolving with the other.

The Greek word for knowledge is *episteme*, and it is incorporated in the modern English word “epistemology”, the field of philosophy concerned with how people know. Epistemology as a concept is not bounded by a single way of knowing. This concept allows us to discuss the nature and difficulties of knowing in the contemporary world without being limited to one form (e.g. deductive reasoning).

Doxa and *episteme* are maintained together through the tangle of popular beliefs and philosophical knowledge. They also coevolve over time into new forms (Norgaard, 1994). Together, *doxa* and *episteme* shape and are shaped by the reality of social structures and their operation.

How does this conceptual framework of *doxa*, *episteme*, and reality coevolving relate to the contemporary moment? First, we understand the current economic *doxa* as economism, or the common beliefs about the economy that keep the economic system going. By economism, we mean the public beliefs and consciousness that sustain the current economic paradigm. These beliefs: a) explain the nature and emergence of the economic paradigm; b) explain and rationalize one’s place in this paradigm; and c) rationalize the dominant ways that we interact with one another and nature (Norgaard et al., 2016; Norgaard, 2019). For example, economism rationalizes how ‘greed is good’ through the ‘moralizing’ logics of markets in opposition to earlier moralities (Fourcade and Healy, 2017). It also rationalizes GDP growth as progress and transcendence through consumption.

Doxa holds prevalent systems together, and the prevalent systems reproduce the dominant *doxa*. In feudal times, the beliefs supporting the manorial system kept serfs and lords working together for several centuries, normalizing obligations and power structures. During the past two centuries, in turn, markets have become the dominant, recognized form of social organization.¹ People’s faith in markets has kept the capitalist system going. If people did not believe food markets would continue to work, they would be desperately trying to grow food in backyards, rooftops, and flower pots. In the process, not only would food markets collapse, but the whole economy would collapse, and vast numbers would die. Like money, the economy itself is a great system of faith sustained by economic *doxa*.

Nearly a century ago, the early Chicago economist Frank Knight argued for the necessity and sanctity of economic *doxa*, though he used the term “religion”:

The point is that the “principles” by which a society or a group lives in

tolerable harmony are essentially religious. The essential nature of a religious principle is that not merely is it immoral to oppose it, but to ask what it is, is morally identical with denial and attack.

There must be ultimates, and they must be religious, in economics anywhere else, if one has anything to say touching conduct or social policy in a practical way...

To inquire into the ultimates behind accepted group values is obscene and sacrilegious... (Knight, 1932, 448–49).

Certainly the large general [economics] courses should be prevented from raising any question about objectivity, but should assume the objectivity of the slogans they inculcate, as a sacred feature of the system (Knight, 1932, 455).

To use a more current term, societies need an “operating system”, a set of beliefs that keep their systems running. Knight is arguing here that economics is the operating system of modern people and that people need to believe in their operating system for it to work. Knight is explicitly arguing, however, that economists must be the purveyors of economic *doxa*. Yet economists are portrayed to be and think of themselves as objective scientists dedicated to *episteme*.

Second, economic theories, pedagogies, and research communities constitute economic *episteme*. In the dominant economic *episteme*, many patterns of thinking are reduced to pure logic, or a set of assumptions about parts of reality and the specifics of how they interrelate. Pure logic typically translates into formal mathematics—perhaps a basic accounting model, calculus, or set theory. Formal assumptions in economic theory, such as rational, informed individuals or the divisibility of nature into property, are justified as essential to the clear reasoning required for mathematical representation. These assumptions sustain popular beliefs about individualism, choice, and the sanctity of property. They partially constitute economism within broader public *doxa*, relying on language and analogs of the dominant *doxa*.

Economic *doxa* and *episteme* are fundamental in what we call ‘the Econocene’. The term is a reference to the Anthropocene. The Anthropocene highlights how people, largely through climate change, have become the major force in planetary change. “Anthro”, however, is unnecessarily imprecise, and scholars have proposed other terms such as the Capitalocene, the Plantationocene, or the Growthocene. We use here instead the prefix “Econo” to emphasize the ties between the rapidity of human-driven environmental change and humanity’s *doxa* about the benefits of market organization and economic growth. In an effort to determine when the Anthropocene started, the invention of the steam engine as the beginning of the acceleration in fossil hydrocarbon combustion is often mentioned. Technologies and how they interface with nature are critically important. Yet, technology and natural resource use are implemented not so much through their own *doxa* as through markets. The term Econocene is thus apt for describing the age we are in.

3. Coevolution: a tale of how the Econocene arose

To understand how we arrived at the Econocene, we must look at the coevolution of economism and economic *episteme* over time. We, among other ecological economists, have made the case for thinking about social-ecological change as a coevolutionary process (Norgaard, 1994; Gowdy, 1994; Kallis and Norgaard, 2010). Evolutionary change happens through social and ecological variation, inheritance, and selection (Kallis and Norgaard, 2010). Over time, diversity can be accidentally produced, partially guided (in social systems), and systematically selected by how well variants in one system fit the environment of the system they coevolve with. While too much diversity in social-ecological systems may result in stagnation, inadequate diversity can lead to a system’s fragility (Biggs et al., 2012). Coevolving systems can become tightly interlocked due to their interdependence. Yet they also change rapidly when new ideas or biological mutations are introduced,

¹ It is important to remember what Kenneth Boulding called the “grants economy” in some writings and the “integrative sector” in others, or the ways that people organize through personal relationships, parenting, and family, as well as among neighbors; through churches, sporting and other leagues, and nongovernmental organizations; and last but not least through government. These non-market forms of social organizations have been more important than markets for most of the last two centuries of the age of markets.

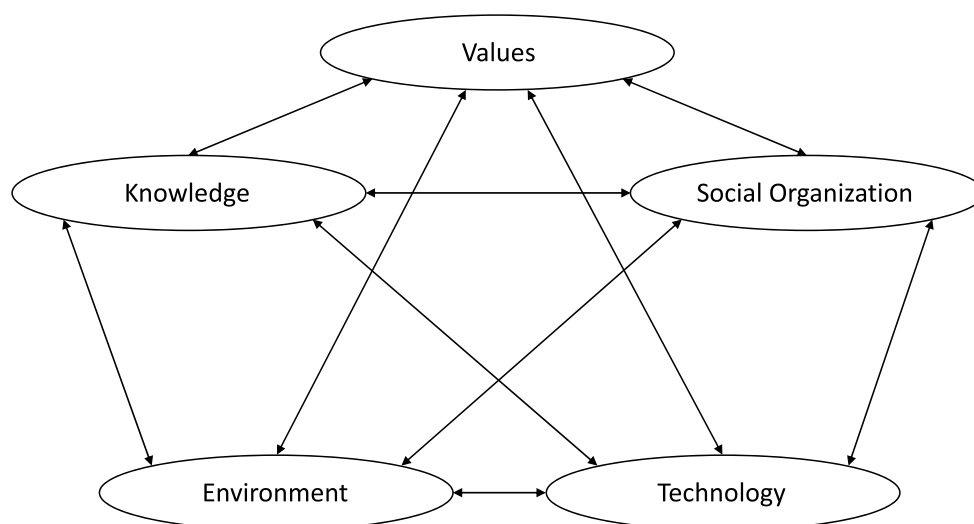


Fig. 1. Coevolving social-ecological systems, with emphasis on social processes.

when experiments surprisingly succeed, and through the decay of key social-ecological features over time.

Fig. 1 illustrates a broad portrayal of social-ecological coevolution. The framework emphasizes how social processes (values, knowledge, technology, social organization) affect each other and the environment directly. As we elaborate by example below, these interdependent systems select on each other over time, producing different configurations of social-ecological relationships. Evolutionary change is qualitative as opposed to quantitative (Georgescu-Roegen, 1979) and thus a co-evolutionary perspective is careful to treat boundaries (e.g. between values and technology) as fuzzy continuums rather than hard boundaries. With everything having changed through coevolution back through time, this portrayal of changing, interdependent categories is a realistic sketch to anyone who thinks historically rather than solely in terms of universal truths.

The environment in this model is not simply something out there that puts a limit on human institutions or ways of knowing. Ecosystems condition what we can and cannot do, but the relationship is mutual and co-constitutive. We change our environments and we change by responding to the environments we have changed. Likewise, knowledge is not external to the social system. What we (think we) know affects what we do, and what we do changes the social systems that we try to know. In turn, this changes our knowledge. Sociologists of science and economics have long grappled with incorporating ‘reflexivity’ (Woolgar, 1988) or variants of it—like the ‘self-fulfilling prophecy’ (Merton, 1948)—into their understanding of knowledge creation. The tipping points and outlier events of history often direct its course, however (c.f. Taleb, 2010). What we do not expect and cannot predict make reflexivity an impartial model for understanding how knowledge manifests in the world. Such dynamics challenge a comprehensive understanding of social systems precisely because they coevolve with our knowledge of them. Knowledge is also positioned – we see and know from the particular cultural and social position we find ourselves in. Here, experiential knowledge is inextricable from broader cultural and natural environments. As such, there is always a diversity of ways of knowing. Those that are ‘selected’ or become dominant through coevolution are determined not only by how well they represent reality, but also by beliefs and institutional, environmental, and technological factors, which in turn they affect.

Societies have long coevolved with the environment by harnessing energy from the sun, wind, land, and water. Industrial society coevolved with fossil fuels—from the invention of the steam engine to the ubiquitous use of agricultural petrochemicals today. Most societies’ sustenance and reproduction now rely on a fossil fuel-driven food

economy. Knowledge and social organization were coevolving with a fossil fuel economy. Beginning in the 1930s, oil fueled the idea of limitless growth and upheld the belief that the economy was liberated from the constraints of land (Mitchell, 2014). Markets were a key part of this coevolutionary process, and they transformed social organization dramatically along the way. The myth of the self-regulated market, or the doxa promoted by early political economists, went hand-in-hand with the enclosures and market institutions that commodified land, people and money (Polanyi, 1944).

Contemporaneously, as much of the world came to resemble the fiction of the self-regulated market, so market economics came to describe how this market economy worked. The critical point here is that economists do not simply describe the world, but they inscribe it by designing policies, markets, and incentives to match theory. Sociologists of economics have long recognized this (Callon, 1998) and used similar concepts to understand the “moralized” nature and “moralizing” force of markets in society (Fourcade and Healy, 2017).

These insights reflect coevolutionary processes among academic economics, doxa, and ‘the’ economy. Mitchell (2014) details ‘the invention of the economy’ during the 30 years between the Great Depression and the Suez crisis. The term economy has existed and evolved since the Greeks, but for most of time it signified the act of economizing. *The economy*, Mitchell argues, is neither a pre-existing reality that we finally came to see nor a pure social construct (2014). It is an ‘effect’ – the result of new “forms of calculation and decision making” that could happen in the home countries of colonial powers (Mitchell, 2002). These activities did not discover but rather ‘reformatted’ knowledge so that large flows of goods and services could be quickly understood and managed from the offices of colonial powers. The efficient control of large datasets on populations, trade, and properties led to metrics, analyses, and predictions about the future that we still use today—GDP and growth rates, unemployment and inflation, cost-benefit, etc. Governments stepped in during the Great Depression and especially the Second World War to plan production and monitor ‘the’ economy in relation to a set of such macro aggregates. The ‘national economy’ was as much a product as a cause of the forms of social organization that came to govern it (the Ministries of National Economy), the technologies that came to measure it (GDP), the forms of knowledge that came to represent it (economics), and the fossil hydrocarbons that made its expansion possible.

The growing use of fossil fuels underpinned the expansion of ‘the’ economy and detached modern peoples from their environments. This greatly marginalized traditional farming knowledge and set up wholly new factory systems of farming. Agricultural and industrial

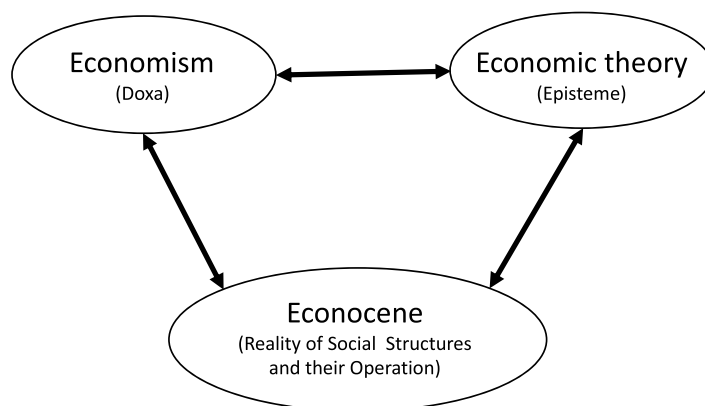


Fig. 2. Economism, episteme, and the Econocene coevolve as the dominant contemporary doxa, episteme, and social structures, respectively.

development facilitated rapid population growth and massive increases in material consumption for many. Knowledge of the environment no longer seemed relevant. Indeed, people increasingly felt free of environmental constraints. This freedom was represented in economic theories of growth and promised by the dominant scientific and technological doxa. Nature still exists of course, but the features of nature have been transformed over the past century, reflecting a coevolution with human beliefs, science, and technology (what is captured by terms such as the Anthropocene or the Capitalocene).

Economism is not the only doxa around. A doxa of living within ecological processes counter to the prevailing economism had rich support outside of economic thought in the latter half the 20th century—from Naess's deep ecology in philosophy to the birth of political ecology. The environmental and civil rights movements in 1960s and 1970s North America and Europe, or the Chipko movement in India around the same time, sought to be counter drivers of unsustainability and injustice that emerged from decades of economic growth.

But these efforts remained on the fringe. In fact, ecological doxa appeared at around the same time that economism was closing around a hard core set of principles that had little tolerance for fundamental ecological critique. This has been well documented in the United States, where neoliberalism arose largely through the Chicago school of economics (for example, [Mirowsky and Plehwe, 2009](#); [Burgin, 2012](#)). Chicago professors Becker, Harberger, Schultz, and Stigler among others clearly bent their academic arguments to promote “free markets” and market reasoning. Yet the main proponent of neoliberalism, Milton Friedman, dedicated his efforts to influencing public and political opinion. Through this process, the Chicago school largely shaped the prevailing doxa, or economism. Many environmental groups began to see their political action as possible only within the dominant legal and economic structures ([Dobson, 2012](#)), thereby getting subsumed within Economism.

The spreading of neoliberal doxa paved the way for the political changes that helped make a neoliberal economy an economic reality underpinning the Econocene. This reaffirmed the relevance of academic neoliberal economics episteme as practiced, with core foci rooted in value monism, rational actor theory, pareto efficiency, and marginal analysis ([Gowdy and Erickson, 2005](#)). The dominant argument explaining the ascent of neoliberal economics is that Keynesian theory could not explain the co-occurrence of inflation and unemployment amidst the energy crisis of 1973–74. Yet the evolution and dominance of certain forms of knowing over others is a social and political process, too. Economics fueled by a neoliberal doxa became insular as a discipline both in theory and practice, while economists gained a superior status as advisors to policymakers ([Fourcade et al., 2015](#)). This process involved the refashioning of institutions or values in the image of the idea.

Through the latter half of the 20th century in the United States, economic beliefs promoted initially by a few key economists transformed the reality of the economy. This happened in different ways around the world. After World War II, economists played key roles in the establishment of the General Agreement on Tariffs and Trade, the World Bank, and the International Monetary Fund. U.S. and U.S.-trained economists led their operation. In the 1990s, economists promoted the exchange of capital through NAFTA and then the replacement of GATT by the World Trade Organization. While international organizations established after World War II initially promoted mixed economies, by the end of the century a supposedly free trade market system reigned (in reality more of an unequal exchange – see [Hornborg, 1998](#)).

The coevolutionary model shows that the evolution of economic science is not simply a noble battle of ideas, where good ideas survive and bad ones wither away. Rather, it is a complex process, which involves social and political struggle alongside changes in values and beliefs, or doxas. The landscape and our social world across the Biosphere have largely been hegemonized by economism. The coevolution between the Econocene and economism has come to dominate other value and knowledge systems.

Though change is continual in coevolutionary processes, certain configurations can become dominant, temporarily locking out alternatives, and pushing variants to the fringes. Our abbreviated story of the Econocene's history reflects the coevolutionary story of today's dominant doxa ([Fig. 2](#)).

Economism continues to keep alternate doxa, epistemologies, and public beliefs in the margins. The rapid, if not accelerating, coevolution of economism and the Econocene adds a new and serious epistemological complication to economic understanding. The world economy now reflects economic beliefs. These beliefs are largely unchallenged even by economic theories seeking to push beyond the outdated, pre-2008 academic economics order. When social-ecological systems are highly connected as they are in our globalized world, information can propagate quickly, potentially risking homogenization of knowledge ([Dakos et al., 2015](#)). The homogenization of public economic doxa is part and parcel with the high connectivity of world economies and the stifling of methodological diversity in economic episteme focused on influencing policy in the Econocene.

Coevolutionary thinking enables us to identify how economism, episteme, and the Econocene relate and evolve with each other without assuming away the unknowns, uncertainties, and the great potential for unexpected events inherent in a complex world. From here, we must strategize the future of an ecological economics intellectual movement grounded in an alternate shared doxa, which we argue requires an intellectual community that supports methodological pluralism.

4. Where do we currently stand? Economic epistemology in the Econocene and cracks in the dominant model

Following the ideals of science, economics is supposed to explain economic reality and future possibilities. In practice, we see a case of economics becoming hegemonic, trying to explain the world while also molding it in its image. By hegemony, in a Gramscian sense, we mean an active process by powerful actors to adapt and reproduce the dominant doxa that reproduces their power as circumstances change (D'Alisa and Kallis, 2016). Hegemony, however, is not a one-way process of coercion – it is based on consent, and on the fact that people need doxa and a certain degree of common sense to give meaning to their own actions and lives. This doxa is the glue, as we argued, that holds a system together.

What economists do then can be revisited as the making–and reproducing of–hegemony and of the doxas that support this hegemony. Economists respond to new problems in ways that attempt to internalize and subsume other ways of knowing into the dominant doxa. For example, environmental economics subsumes fundamental social-ecological problems of consumption, distribution, and cost-shifting as cases of negative market externalities. Rather than problems destabilizing the dominant model then, problems become opportunities for the expansion of economism to new realms, from sociology and political science, to ecology.

Economic critics, looking back on the experience of 2008, cannot explain how the vast majority of economists missed foreseeing the likelihood of collapse and failed to encourage precautionary actions to prevent it. Similarly, it seems difficult to explain why so few changes were instituted in financial sector regulation since the disaster. One way of understanding this is that the dominant way of thinking in economics is so entangled with economism that economists were in no better a position to “see” what was happening than participants in financial markets. Leading economists had too few antennae up, too few tools or ways of seeing, to detect the crash or rebuild a safer financial sector after the fact (Desai, 2015).

With the economy coevolving around economism, how can something emerge that leads to a different path? From a coevolutionary perspective, everything seems interlocked in the short term – but in the long-term, evolution implies that there is always change. Additionally, radical change happens not only because people constantly create new ideas and question the established doxa, but also because reality bites back, creating tensions between ideas and experiences. The interwar crisis of liberalism was one such generative moment, resulting in new understandings and economic institutions.

The looming climate breakdown could turn out to be such a moment of crisis, when the dominant model gets shaken, and the problematic entrenchment of economists in their doxa becomes visible. Consider for example the belief in progress. Progress is an essential part of economic doxa, indeed, the doxa of all science and technology. When addressing economic change, economists incorporate belief in progress in their pre-analytic vision, research design, interpretation of results, and communication to the public (Norgaard, 1994). For economists, this almost always means tying progress to the growth of gross domestic product. This is done despite the fact that most economists can easily identify the reasons why there is little correlation between wellbeing and growth. When leading climate denialists appeal to the doxa of progress, they resonate with people through economism. This partially helps explain the widespread public denial of climate change in the face of already disastrous consequences. The idea of progress saturates the collective mind of economists and everyday people to such an extent that the idea that we might have to “degrow” to avoid climate breakdown seems an oxymoron. Using the term degrowth is powerful precisely to the extent that it helps people realize their entrenchment in economic thinking (Kallis, 2018).

Though economism reigns, natural scientists are still able to observe the rise in atmospheric CO₂ and foresee the great uncertainties and

unknowables of the consequences. Climate scientists' understandings of reality, however, strongly clash with key beliefs of economism, economic episteme, and hence the “reality” of economists and much of the public. Such moments of dissonance are opportunities for new coevolutionary trajectories to emerge. The emergence of an intellectual movement of ‘deep’ or ‘social’ ecological economics (Spash, 2013) can be seen in this light. But those who reproduce economic doxa and episteme will try to adapt this ‘undisciplined’ reality to the models of their discipline. Economists will attempt to frame climate change as a manageable problem to be corrected while staying the course as much as possible. This is why they dance around the fact that climate change is primarily an equity problem and that solving it will fundamentally change the economic course and challenge existing doxa. Economists and policy makers continue to use the standard tools of the current economic episteme for weighing the benefits and costs of correcting for climate change, even though these costs and prices are derived from the markets of the economic system that is on the disastrous course (Howarth and Norgaard, 1992).

This is a reality. Doxa is essential to science and societal coordination at large scales, and will be a fundamental part of any global society. In this way, it makes no sense to complain about doxa; rather, we must work toward changing it.

5. What is to be done? Methodological pluralism for an ecological economics movement

Can there be an alternative movement, which conceptualizes and becomes part of an alternative process that is sustainable, just, and provides meaningful lives? Remember that from a coevolutionary perspective, there is constantly variation outside the interlocked coevolutionary path, a source of change that can always destabilize the dominant regime.

The first central issue to address is whether doxa can change fast enough with changing knowledge of climate change and its consequences. Second, is it possible to have enough scholars across environmental and social sciences, including humanists, especially ethicists, who can deliberately choose not to be sucked into the coevolving vortex of economism and the Econocene? Third, can these scholars work collectively across epistemologies, within the coevolving process, to guide shifting doxa (and institutions) in desirable directions? These questions imply that the scholars of the future be deliberately methodological pluralists with multiple antennae up. The world needs alternative guidance in the context of some larger dynamic reality beyond the Econocene, beyond economism.

A main challenge to the original case for methodological pluralism was that it lacked a foundation—that its position on questions of ontology and epistemology was unclear (Spash, 2012). The foundations for methodological pluralism, we offer, can be found in coevolutionary thinking. This paper uses a theory of coevolution to describe the uncertain dynamics of our economic and social systems, with examples from the contemporary history of the ‘Econocene’. From a coevolutionary perspective, reality is complex and entangled. The intertwining of what *is* and *how we know* what is—or the meta-framing of ontology and epistemology—are structured by culture and historical context as well as by what tools and forms of knowing we have available to us. What we *know* and what exists to create the conditions for a particular way of knowing is already, in itself, a partial understanding (Haraway, 1998). The production of knowledge is part of complex reality. A variety of ways of knowing more or less fit the social and natural environments they partly help create. This diversity in ways of knowing is part of reality. This is good and should be maintained, because diversity is a source of innovation and change, one that keeps alive the possibility for new systemic alternatives when the dominant coevolutionary path encounters crisis.

None of these claims deny the existence of an objective reality or one that is, in part, socially constituted. It is the humble recognition of

great uncertainty that leads us not only to an argument in favor of a plurality of ways of seeing (methodologies, disciplines, etc.), but also of ways of knowing what truth is (epistemologies). A coevolutionary worldview thus offers a foundation for methodological pluralism through an openness to epistemological pluralism. We, like Spash, agree that we cannot know reality with certainty. Coevolutionary foundations for ecological economics, however, extend beyond adherence to one meta-framework (e.g. critical realism) as a descriptor of reality and knowledge production. Let us explain why.

We share Spash's (2013) desire for a 'deep' or 'social' ecological economics movement that is sufficiently distinct from 'new resource economics', and which makes a difference in the pursuit of sustainability and equity. As ecological economists and interdisciplinary scholars, we strive for an episteme and doxa that supports and coevolves with a sustainable environment, a just social system, and meaningful livelihoods. How do we contribute to making this happen?

The process of coevolution cannot be controlled, but as scientists we are actors in the production of knowledge, which in turn is part of coevolutionary change. One observation is that change will not come just by getting our models or epistemologies right, but by how well these fit a broader coevolutionary path of transition. The success of ecological economics as a field will be part and parcel of interlocked changes in institutions, values and popular beliefs. Ecological economics is more likely to be relevant if there is a green movement with a doxa that changes values and institutions in a direction of creating the world that ecological economics represents.

For the time being, ecological economics remains a small intellectual movement, alongside other political and scientific schools of thought with longer histories that are also oriented to a socio-ecological transition. These schools range from neo-Marxist or eco-socialist geographers and social scientists, to Keynesian or institutional and radical political economists, to ecofeminists and feminist economists, political ecologists, and anthropologists of various traditions (to name only a few). Should ecological economics offer a bigger tent that mirrors the diversity of the intellectual movement that challenges economism? Or should we partially close our doors and try to develop a more distinct and internally coherent voice within this broader pluriverse of alternatives? Spash points to the paradox of keeping open doors to those who want to close doors—i.e. letting neoclassical economics and methodological positivists inside the pluralist tent of ecological economics. On the other hand, it may also be paradoxical for pluralists to close doors to a subset of sanctioned epistemologies. Paradoxes are perhaps conceptually consistent with our partial knowledges and the great uncertainty of social-ecological systems undergoing rapid change, but this does not absolve us of the responsibility to carefully negotiate openness and closure to new ideas within the field.

Spash (2012) started this important debate for the community and convincingly challenged ecological economists to be more aware of their epistemological assumptions and their implications. We agree that forming an identity for ecological economics requires a certain degree of closure and a better definition of our 'doxas'. Put simply, we agree with the need for a structured, 'critical' pluralism, but we do not see this call as mutually exclusive with the case for methodological pluralism. The criteria for closure of some intellectual developments should be part of an open debate that deliberates the intellectual and political commitments across incommensurable ways of knowing. This is preferable to confining the scope of the field to a philosophically determined set of explanations that a priori exclude perspectives and research, because neither usually conforms consistently to a neat meta-framework in practice anyway.

What constitutes criteria for structuring boundaries in a methodologically pluralist community? What are the core premises of ecological economics? One may consider fundamental concepts such as the incommensurability of values, the limited substitutability of nature, entropic nature of the economic process, or the limits to growth. Spash (2012) provides a reasonable first set of ontological, epistemological

and ideological principles that can feed into a deliberation within the community about its identity, and a reflection on how to reshape its institutions (from the content of the journal, to its educational material and programs, or strategies of training and faculty placement of young ecological economists). We are less sure, however, of Spash's attempt to base this closure on epistemology, and even less so on a single meta-framework, that of critical realism (or any other for that matter). Why?

First, given that there is no single best way of knowing and there are multiple, incommensurable epistemologies (Spash, 2012) that each offer some light in a complex reality, it is not clear why we need to opt for one. In a world of multiple simple methods, none are best, and this is a reason why we need to consider all, or at least many. Multiple ways of knowing are an existent condition of human knowing. As such, opposition and contradiction are inherent dimensions toward knowledge production. We can and should debate the potential problems with political commitments resultant from such plurality.

Second, the set of principles, including the epistemological ones, that Spash provides are open enough to accommodate multiple epistemologies that themselves push against the hierarchical ontology of critical realism. One can imagine a dialectics-based eco-Marxist or a logical empiricist physicist conforming in their ecological economics research with most of the principles Spash puts forward, without necessarily seeing themselves as (or actually being) critical realists. And this is good, because an open approach on the question of epistemology will allow easier collaborations with other schools of thought that are allies in the pursuit of socio-ecological transformation.

Third, labelling the epistemology of specific approaches or scholars and their presumed ontological commitments is often difficult, and therefore a problematic criterion for gatekeeping.² Dismissing an epistemological framework also fails to recognize that epistemological commitments are themselves malleable and often incomplete.

Fourth, any single epistemology is bound to have blind-spots. For example, Spash (2012) recognizes as a matter of principle the value of indigenous knowledge. Some indigenous knowledge however is spiritual, animistic, or linked to customs and traditions that do not conform necessarily to the Western standards underpinning critical realism. This is why we insist on a plural approach that accommodates different ways

² For example, Spash (2015) classifies Bruno Latour as a 'strong social constructivist' among those who 'totally dismiss the concept of nature'. Spash sees no place for such constructivism in ecological economics. In Spash (2012) there are references to strong social constructivists who deny that a real world existed before humans, and claim that all truth is relative. No scholar of course describes herself or himself as a relativist and we would be surprised to hear post-structuralists agree with creationists that there was nothing before humans. Constructivist arguments are more nuanced than that and such characterizations misrepresent the work of scholars in science and technology studies like Latour, or the important contributions to understanding the production of classifications, from say Foucault and his disciples or philosophers of science like Ian Hacking. Mitchell's work on the invention of the economy, for example, follows a Foucauldian approach and excavates the social and political history of how a particular classification, that of the economy, came in effect, got normalized and came to be taken for granted. To reveal the power relations involved in the production of new classifications does not relativize knowledge, unless one starts from a very conventional understanding of what knowledge is and how it is produced. Latour analyzes the processes through which scientific communities come to define what is a fact and distinguish good from bad facts. Far from denying the existence of nature or relativizing facts about climate, Latour is making precisely the point that if we are to defend the case for action against climate change from deniers and 'skeptics' who relativize climate science as politically motivated, we have to develop a much more realistic understanding of the processes through which scientific truth is being produced (Kofman, 2018). Why this is 'hard constructivism' incompatible with 'critical realism' and therefore incompatible with ecological economics is far from clear. In our view, this points to the limits of such labelling and gate-keeping, especially when it comes to such complicated matters and bodies of thought, that we cannot expect every ecological economist to be familiar with at sufficient depth.

of seeing. While perhaps this requires ecological economists to hold contradictory ontological positions collectively or over time, the consequence will be new understandings and cross-culture and cross-episteme dialogue.

Fifth, even if we wanted to bound ecological economics around a single epistemology, the reality is that the people who see themselves as ecological economists are eclectic and would not conform to such bounding. Ecological economists, even the subset of us that Spash (2013) classifies as social ecological economists, are doing a variety of things. Some of this scholarly activity could be classified as critical realism, while others would be closer to strong constructivism or strands of logical empiricism not limited to natural sciences. Young ecological economists are trained in a variety of disciplines, methods and ways of knowing. What will be gained by forging their allegiance to a single one (assuming this could be accomplished)?

We do share Spash's call to set clear boundaries that would leave what we called here as 'economism' out of ecological economics. Economism as we explained is currently a colonizing force, and both its logic and its practice are incompatible with methodological pluralism.

Having said that, we see a problem with a sweeping exclusion of any and all methods and ideas from mainstream economics. First, neo-classical models do illuminate aspects of reality, more so since much of economic reality has been fashioned to their image. Like it or not, as Polanyi (1957) noted first while criticizing the supposed universality of market economics, a market model is likely to explain better how an instituted market works than say a more realistic view of the economy as a provisioning system. Historical and sociological insights on markets need not subsume to the mathematical representation of one; rather they each offer different insights. Second, there are works by economists using some of the conventions of neoclassical economics in modeling the macro-economy that are not reproducing the myths and rhetoric of methodological positivism or individualism, nor do they seem to contravene many of the principles espoused by Spash. We cannot see how post-Keynesian models with macro-equations such as those of Jackson and Victor (2015) or Victor's (2008) dynamic system model simulating no-growth scenarios, are reproducing the ideology of economism. You can still use econometrics to look for broad patterns in aggregate data without accepting the premises of individual maximization, or optimal equilibrium (e.g. Fanning and O'Neill, 2019). Or you can use accounting formulas and data to document increasing inequalities (Piketty, 2014). We remain unconvinced why such works should be kept out of ecological economics on the basis of epistemological purity.

Our case here for openness to neo-classical models, statistical analyses or mathematical formalism is not motivated by misconceived pragmatism. We are not arguing that this is what the public or the policy makers are used to hearing and thus we should speak the dominant language (Spash, 2013). Rather our point is that the different ways of seeing among scholars are too complex, nuanced and contradictory to be neatly labeled into categories, one of which then gets rejected entirely from ecological economics. Our responsibility as a community is to work thoughtfully and critically to determine which scholars' works fit with the core principles and commitments of the field, and which not. The challenge is not to find the proper epistemological framework for ecological economics, but the more arduous work of defining and sustaining the processes that constitute us as a community, deciding through practice who can contribute to our 'commons', under what conditions and rules, and who not. Such an endeavor requires the community to maintain open avenues of communicating with (and criticizing in certain cases) other schools of thought.

6. Conclusion. For a deliberate pluralism

This article reinstated and refined the case for methodological pluralism as part of ecological economics. We defended a 'tent' approach for ecological economics. The tent should be big enough to

accommodate multiple ways of knowing and allied schools of thought, but closed sufficiently to leave out work which—explicitly or not—expands the imperialism of economism to the realm of sustainability and equity. The way to close it, however, is not by choosing one epistemology, however open that one epistemology may be, and keeping everyone else out. Closure will rather result from the hard work of forming a community, coalescing around a doxa and a more limited number of questions and approaches, while protecting this open scholarly community from colonizing forces that want to subsume it.

The case for methodological pluralism in the Econocene still rests on the benefits of an open scientific community that epistemological and methodological pluralism help facilitate. New lessons from the past three decades provide additional reasons for deliberate methodological pluralism. Heretofore, ecological economics has been tolerant of pluralism, letting it occur rather deliberately practicing pluralism in order to see and respond to possible futures, as well as to protect the existing pluriverse, and prepare for a better one. Through our coevolutionary tale of economism, economic thought, and the Econocene, we emphasized interdependencies that can grow hegemonic and problematic. We have seen how economism promoted by economists has shriveled economic episteme, blinding many economists to negative social-ecological feedbacks and signals of detrimental dynamics. Most economists have taken no steps toward the bold actions required to slow and avoid the disastrous consequences of climate change, despite being in the privileged position to say something with influence.

At the same time, we illuminated how cracks in the dominant epistemology reveal the belief system underpinning our contemporary moment. Through these fissures we see both the role that beliefs play in shaping the social-ecological world and how windows of change—through chance or coevolution—emerge. These windows will be blind to us, as a community, if we do not keep multiple methodological antennae up. To move beyond the Econocene, we require an acceptance of pluralism and a willingness to learn how to participate in pluralistic discourses among schools of thought. This needs to be coupled with, at a minimum, a consciousness among practitioners of the logic of methodological pluralism and perhaps even a coevolutionary framing.

A coevolutionary framework to guide ontological commitments and underpin epistemic and methodological pluralism still leaves unaddressed the guiding beliefs that ecological economics as a field can and should gather around. What doxa support sustainability and equity in a changing, co-evolving world? We require an "escape" from economism – or the logic of economic values underpinning every dimension of life and nature. A doxa for sustainability and justice should reflect core principles among the diverse scholars in ecological economics. It should be anchored in recognition of global and local ecological feedbacks with human activity and a mutual care for each other and the Earth. The doxa of an ecological economics community supports livelihoods where dogmatic individualism and excessive consumption are decentered. Equitable material well-being on a planet with 10 billion people is unlikely to diminish the pressing questions that economists ask—but a renewed public consciousness of sustainability, equity, and care is sure to result in creative, sustainable solutions.

We have called for methodological pluralism on the grounds that our Econocene is in lock-step with flawed and problematic economic doxa. Coevolutionary theory underpins this work and emphasizes the epistemological pluralism required for an open scholarly society in a world of great uncertainty and partial knowledge. If an alternative of ecological economic thought on sustainability, equity, and care (call it Biospherism or otherwise) is to emerge, then this will require the creation of new diversity, the protection of new niches, and ruptures with the existing configuration when conditions are right and multiple coevolutionary forces come together. Our hope is that ecological economics can be at the center of generating this new set of concerns, representations, and institutions that have the 'effect' of creating a new system and way of thinking about—and classifying—our world beyond the ivory tower.

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