Economics

Rethinking the theoretical foundation of economics I: The multilevel paradigm

--Manuscript Draft--

Manuscript Number:	ECONJOURNAL-D-22-00030
Full Title:	Rethinking the theoretical foundation of economics I: The multilevel paradigm
Article Type:	Research Article
Keywords:	Economic paradigm; multilevel selection; methodological individualism; wellbeing; uncertainty
Manuscript Region of Origin:	GERMANY
Abstract:	This article offers a new paradigm for economics: the “multilevel paradigm,” which applies the Darwinian theory of evolution to the analysis of economic processes. “Darwinian” refers to all variation/selection/replication processes, not just genetic evolution, making it highly relevant to economic theory and practice. The economy is viewed as a system that is embedded within political, social and environmental systems. The evolution of economic activities is understood in terms of variation (innovation), selection (cooperative and competitive relations that survive) and replication (transmission and proliferation of ideas). The multilevel paradigm comes with its own definition and purpose of economics, as the discipline that explores how resources, goods and services can be mobilized in the pursuit of wellbeing in thriving societies, now and in the future. We describe the prominent characteristics of the multilevel paradigm: flexible, multiple levels of functional organization; the primacy of social relations, ignorance as uncertainty; multi-faceted, context-dependent wellbeing; and multilevel evolution as progress.
Manuscript Classifications:	2: History of Economic Thought, Methodology, and Heterodox Approaches; 16: Economic Systems; 20.2: Cultural Economics • Economic Sociology • Economic Anthropology

Rethinking the theoretical foundation of economics I: The multilevel paradigm

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3 March 2022

Contents

Abstract

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Keywords: Economic paradigm, multilevel selection, methodological individualism, wellbeing, uncertainty

Introduction

Economics is a diverse field of inquiry with many schools of thought dating back to the 18th century. For the last 70 years, however, it has been dominated by a theoretical edifice that originated in a 19th century effort to create "a physics of social behavior" (Beinhocker, 2006; Hodgson and Thorbjorn, 2010) and is now known as neoclassical economics. The term "orthodox" is used to identify the dominant status of neoclassical economics, compared to a constellation of other schools of thought, such as Keynesian, Institutional, Behavioral, Ecological, Evolutionary, Identity, and Neuroeconomics. These schools of thought vary in their compatibility with neoclassical economics, with the most disparate given the label "heterodox".

The dominant status of neoclassical economics merits the word "paradigm", a word that dates back to the 1500's and today is associated with the philosopher Thomas Kuhn (1970). For Kuhn, a paradigm is an internally coherent system of thought that results in useful insights but also finds it difficult to escape its own assumptions. It defines a discipline by determining what is to be observed, what types of questions are to be asked, how the answers to these questions are to be structured, what kinds of empirical evidence is to be gathered in finding these answers, how empirical evidence is to be interpreted and what sorts of predictions are to be made.

We think that the concept of "basins of attraction" from complex systems theory can refine what Kuhn meant by paradigms. This term refers generally to any system – such as a biological ecosystem, a human social system, or a configuration of ideas – that has multiple local equilibrium states rather than a single global equilibrium.[1] Visually, this is represented by a number of bowls that are placed next to each other, with the current state of the system as a ball lying at the bottom of one of the bowls. The system resists incremental change – being

[1] In mathematics, a basin of attraction is the set of all initial conditions in the phase space whose trajectories converge to the attracting set. In social-ecological systems, a basin of attraction is a resilient equilibrium state, which has the capacity to absorb shocks so as to retain the same function and structure.

pushed up the side of its bowl – and must be pushed far enough up the bowl to fall into another basin of attraction for lasting change to occur. The system can also wander around between basins of attraction. Whereas a Kuhnian paradigm may be understood as an equilibrium configuration of ideas, a basin of attraction is also concerned with the dynamics of ideas surrounding the equilibrium.

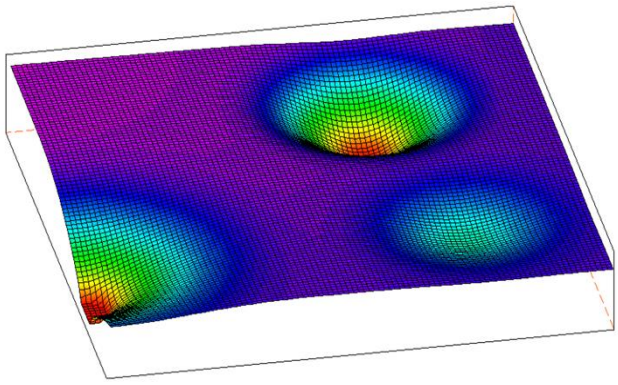

Figure 1: Basins of Attraction

When orthodox economics is seen as a basin of attraction and other schools of economic thought are seen as incremental change efforts, we can begin to appreciate why the many critiques leveled against the orthodoxy, despite making excellent points, have failed to change the dominant mode of thinking in the economics profession.

What's needed is a new basin of attraction, a new configuration of ideas with its own gravitational pull. In this article, we propose that Darwinian evolution, not a "physics of social behavior", is the best starting point for a new economic paradigm[2]. By Darwinian evolution, we mean any process that combines the three ingredients of variation, selection, and replication. This definition includes cultural evolution in addition to genetic evolution, making evolutionary theory relevant for managing human affairs over short time scales.

[2] The economist Robert Frank (2011) has also proposed that Darwin, not Smith, will eventually be regarded as the father of economics

Why doesn't an evolutionary paradigm for economics already exist? The Norwegian-American economist Thorstein Veblen called for it in 1898 and a school of thought called Evolutionary Economics was launched with the publication of Richard Nelson and Sidney Winter's "An Evolutionary Theory of Economic Change" in 1982. We will discuss these early contributions in more detail later. For now, suffice it to say that two major factors prevented the development of an evolutionary paradigm for economics until recently.

First, even though evolutionary theory has proven its explanatory scope within the biological sciences, it was largely restricted to the study of genetic evolution for most of the 20th century, as if the only way that traits are replicated is through genes. It wasn't until the 1970's that evolutionary thinkers began to go back to basics by defining Darwinian evolution as any process that combines the trio of variation, selection, and replication – no matter what the underlying mechanisms. When Nelson and Winter wrote their book, they had little from evolutionary science to draw upon. That situation has now changed, with a burgeoning literature on human cultural evolution of relevance to economics.

Second, many academic disciplines, including economics, the other human social sciences, and evolutionary biology, were influenced by a common tide of individualism during the middle of the 20th century. Individualism comes in many varieties (Hodgson 2007) but all of them privilege the individual organism as a fundamental unit of analysis and attempt to reduce all things social to the thoughts and actions of individuals. In economics, this manifested as the rational actor model of neoclassical economics and the treatment of supra-individual entities such as households, firms, and states, as if they are rational individuals. In the other human social sciences, it manifested as "methodological" individualism (a term that economists also use), as if it can be justified on the basis of its practical utility regardless of its philosophical underpinnings. In evolutionary biology, it manifested as the theory of individuals maximizing the fitness of their selfish genes. In popular culture, it manifested as Ayn Rand's *Atlas Shrugged*, Gordon Gekko's "Greed is Good" speech in the movie *Wall*

Street, and Margaret Thatcher's notorious quip "There is no such thing as society…" in the 1980's.

In this article, we propose the "multilevel paradigm" as an alternative basin of attraction for economics. In so doing, we will focus as much on a paradigmatic alternative to individualism writ large as about the neoclassical economic version.

The multilevel paradigm recognizes that functional organization can evolve – or fail to evolve – at any level of a multi-tier hierarchy of units, such as from genes to ecosystems in biological systems or individuals to global governance in human economic and other social systems. At any scale, the evolution of functional organization requires a process of selection at that scale and tends to be undermined by selection processes at lower scales. This multilevel dynamic provides the new foundation for economic theory and practice, along with all other forms of positive social change.

In what follows, we will first get straight to work describing the multilevel paradigm. This requires a short review of basic evolutionary principles and examples from biology that might seem far removed from economics. Rest assured that there is a deep connection, just as there is between neoclassical economics and its roots in Newtonian physics.

After our short review, we will show how the study and practice of economics can be rebuilt on a multilevel evolutionary foundation. This requires redefining the very definition and purpose of economics, along with an examination of the role of theory in relation to empirical inquiry.

Outlining the multilevel economic paradigm as a new basin of attraction with its own gravitational pull is the main objective of this article. In a second companion article, we will show how the new paradigm can be put to use managing the cultural evolution of economic systems embedded within larger social systems at multiple levels, from individuals working in small groups to global governance. In a third companion article, we will compare the multilevel paradigm to the neoclassical paradigm and discuss why it is so difficult to get from

"here" to "there". We will also discuss a number of other schools of thought within economics to show how they can gain more traction within the multilevel paradigm than they have within the neoclassical paradigm.

We have written this article with three audiences in mind: 1) neoclassical economists; 2) economics who identify with other schools of thought within the economics profession; and 3) the richly transdisciplinary community of scientists and scholars who are contributing to the multilevel paradigm. This requires writing in an accessible style and avoiding the jargon of any particular discipline.

A whirlwind tour of basic evolutionary principles

The root difference between a non-living physical system and a living system is *functional organization*. A nonliving physical system can be very complex but isn't designed to *do* anything – unless it is an artifact of an organism such as a human, a dam-building beaver, or a nest-building bird. In contrast, organisms and their artifacts are largely *designed to do something*.

The analysis of functional organization

The study of functionally organized units not only enables but also demands a certain style of analysis. To see this, imagine being assigned the task of analyzing two objects: a snowflake and a fruit fly. The snowflake has plenty of structure that arose from the process of ice crystallization. Since it is not designed to do anything, however, the only way to analyze it is in physical terms. In contrast, the fruit fly has been designed by natural selection to do something; namely, to survive and reproduce in its environment. This fact will inform your entire method of analyzing the fly. The whole organism will become your anchor of analysis. Everything below the level of the organism – its organs, cells, and molecules – will be analyzed in terms of their contribution to the functioning of the whole. Everything above the level of the organism – such as fly populations and multi-species ecosystems that include the

fly – will be analyzed as a complex system composed of agents following their respective adaptive strategies.

The distinction between what takes place below and above the level of the whole organism is crucial. Two meanings of the key phrase "Complex Adaptive System (CAS)" need to be distinguished: A complex system that is adaptive *as a system* (CAS1) and a complex system *composed of agents following their respective adaptive strategies* (CAS2) (Wilson, 2016; Wilson & Madhavan, 2020). A fruit fly qualifies as CAS1. A population of fruit flies or an ecosystem that includes fruit flies qualifies as CAS2. The most important point to keep in mind is that, except under special conditions discussed below, *CAS2 systems do not self-organize into CAS1 systems*.

Before outlining these special conditions, it is important to stress how often they *fail* to apply in both natural and human systems. Consider the following examples from nature (human-related examples will be provided later):

• Natural selection might increase the reproductive rate of individual fruit flies, resulting in population dynamics that become chaotic (Philippi et al., 1987).

• In many species, infanticide – killing the babies of others to have one's own babies – is a major source of infant mortality, disrupting the social life of groups and diminishing the population size of the species (Van Schaik & Janson, 2000).

• In many species of migratory birds, females experience higher mortality than males during migration and on the wintering grounds because the males claim the best habitats for themselves. This benefits the males but at the expense of females and contributes to the decline of the bird populations (Greenberg et al., 2005).

• When beavers move into an area, they transform the ecosystem in ways that are best understood as increasing the fitness of beavers. Collateral effects on other species and

changes to ecosystem processes such as nutrient cycling are mostly byproducts of the adaptive strategies of a single keystone species (Bailey et al., 2004).

The fact that CAS2 systems do not robustly self-organize into CAS1 systems calls the very concept of a balance of nature into question – and, as we will see, the concept of the "invisible hand" in economics[3]. Evolutionary ecologists have largely abandoned the notion that nature, left to itself, strikes some kind of harmonious balance (Bodkin, 1990). Instead, natural biological systems are frequently out of equilibrium or can settle into one of many basins of attraction. The word "ecological regime" is used to describe a stable assemblage of species (Biggs et al., 2009), a term that aptly invokes what we already know about human political regimes. In human life, the word "regime" implies a degree of stability but says nothing about how well the regime functions for the common good. Human regimes span the range from despotic to inclusive (Acemoglu & Robinson, 2012). Biological regimes are no different.

To summarize, because the individual fruit fly is a functionally organized unit, it becomes an anchor of analysis, governing how we study everything below the level of the individual (its organs, cell, etc.) and everything above the level of the individual (populations, ecosystems, etc.), although in different ways. We could make the same points for a human-made implement such as a Swiss watch or an animal construction such as a bird nest or a beaver dam. Strictly speaking, these constructions are not living systems, but they are extensions of living systems – what Richard Dawkins called an extended phenotype (1982) – and therefore qualify for functional analysis. Knowing that a watch is designed for the purpose of keeping time, you would study all of its parts in terms of their contribution to the whole. You might also study watches as part of larger systems, such as the watch industry in Switzerland or the whole Swiss economy, but you wouldn't necessarily assume that those

[3] Both concepts can be traced historically to the pre-Darwinian Christian cosmology of harmony at all scales (Gowdy et al., 2013).

larger systems run with the precision of a Swiss watch. A single watch is a CAS1 system. The watch industry of Switzerland and the whole Swiss economy are CAS2 systems.

Another basic point about the study of functionally organized units is that they are seldom *entirely* functionally organized. This is true for a human social group as much as for a biological unit such as a fruit fly or a human artefact such as a watch. Evolution – including technological evolution – is an historical process, resulting in adaptations that are more like Rube Goldberg devices or what a tinkerer would assemble from spare parts, rather than what an engineer would produce on a drawing board (Jacob, 1977). Adaptations have byproducts that themselves have no function, such as the color of blood or the triangular spaces (spandrels) that are formed when arches are placed next to each other (Gould & Lewontin, 1979). Some traits evolve by chance (e.g., genetic or cultural drift) rather than by contributing to survival and reproduction. Any given trait is part of a developmental system and cannot be analyzed in isolation[4].

Another important reason for departures from functional organization is called evolutionary mismatch (Giphart & Van Vugt, 2018; Lloyd, Wilson & Sober, 2014). As an example from nature, many species of aquatic insect evolved to use reflected light as a cue to find bodies of water when they are in flight. This results in a fatal attraction to man-made reflective surfaces such as glass buildings and solar panels (Horvath et al., 2010). An adaptation to an earlier environment has become maladaptive in the present environment and only subsequent evolution or a human intervention can remedy the situation. Evolutionary mismatches abound in human life and our impact on the planet has created mismatches for nearly every species on earth. In the socio-economic sphere, the unhealthy predilection for

[4] For example, the selection of docility in domesticated animals results in a whole suite of other traits called the domestication syndrome, which also exists in humans as a self-domesticted species (Dugatkin & Trut, 2017; Hare & Woods, 2020; Wrangham, 2019)

sugary drinks and dysfunctional attraction to digital cues emitted by one's smartphone are examples of evolutionary mismatch.

Multilevel functional organization

At first glance, our discussion of functional organization thus far might seem to support Individualism, which treats the individual organism as a fundamental unit of analysis. But this is true only insofar as the individual is the unit of selection. This point is easily understood with regard to biological examples. Imagine repeating the example of the fruit fly with a social insect species such as honeybees. The individual bee is a unit of functional organization in some respects but in other respects it is more like a cell participating in the functional organization of a multicellular organism. This is due to the fact that many traits in honeybees evolved on the strength of causing hives to survive and reproduce better than other hives, as opposed to individual bees surviving and reproducing better than other bees within the hive. Insofar as the hive becomes the unit of selection, it becomes the anchor of functional analysis (Gordon, 2010; Holldobler & Wilson, 2008; Seeley, 1995, 2010).

Cancer can be used to make the same point (Aktipis, 2020). Cancer is the process of natural selection among cells within multicellular organisms. A cell that proliferates at the expense of neighboring cells is adaptive in the evolutionary sense of the word. Since evolution has no foresight, the fact that cancer cells eventually bring about their own demise is only to be expected – like fruit flies that destabilize their population dynamics with their high reproductive rates. With honeybees, we need to go above the level of the individual organism to find the unit of functional organization. With cancer, we need to go below the level of the individual organism to find the unit of functional organization.

The key to identifying units of functional organization in nature is by making a nested series of relative fitness comparisons. Genes that outcompete other genes within the same organism become like cancers. Genes that cooperate with other genes within the same

organism to outcompete other organisms lead to functionally organized individuals, who often behave cancerously toward other individuals. Individuals (and their genes) that cooperate with other individuals in their social groups to outcompete other social groups become part of functionally organized units that are larger than themselves, but these groups often compete harmfully with other groups. Even whole ecosystems can become functionally organized if they are selected as units. For example, when multicellular organisms differentially survive and reproduce, their microbiomes are being selected along with their genes. The degree to which our genes interact with ecosystems composed of trillions of microorganisms comprising thousands of species is only in the process of being discovered (Yong, 2006).

This nested series of fitness comparisons is called *Multilevel Selection (MLS) theory* (Wilson, 2015). Its history begins with Darwin, who realized that prosocial behaviors are selectively disadvantageous within groups and require a process of between-group selection to evolve (Sober, 2010). MLS theory was widely rejected in the 1960's in favor of the view that selection operates only at the level of individuals and their selfish genes (Dawkins, 1976; Williams, 1966; see Agren 2021 for a recent review[5]). At the time, this was celebrated as a great intellectual achievement. In retrospect, it can be seen as merely the advent of Individualism, coinciding with the advent of Individualism in economics, in the human social sciences, and (to a large degree) in everyday life of Western societies.

Today, there is widespread acknowledgement that MLS theory's nested series of fitness comparisons is a fully legitimate accounting method for evolutionary change. In addition, all other theories of social evolution (e.g., inclusive fitness theory, evolutionary game theory, selfish gene theory), even when they were initially conceptualized as alternatives to MLS theory, must acknowledge the same "stubborn facts" to remain biologically realistic (Okasha, 2006; Sober & Wilson, 1998; Wilson & Wilson, 2007;

[5] There is a tension in the literature reviewed by Agren (2021) between the gene's eye view and an individual-level analysis such as inclusive fitness theory.

Wilson, 2015). These include: 1) All evolving populations are metapopulations, which are subdivided into groups of various sizes and duration. 2) As a basic matter of tradeoffs, prosocial agents are by their nature vulnerable to exploitation by more self-serving agents in their immediate vicinity. 3) Therefore, fitness differentials favoring prosociality at larger scales are required to counterbalance the negative fitness differentials at smaller scales.

The basic assumptions of n-person evolutionary game theory can be used to make these points with mathematical rigor (Maynard Smith, 1982)[6]. Evolution takes place in a large population subdivided into groups of size n. Although n is allowed to vary in some models, it is treated as a constant in most models (e.g., 2-person game theory) as a simplifying assumption. Within each group in Prisoner's Dilemma games, selfish strategies such as ALL-DEFECT (ALLD) have an advantage over cooperative strategies such as TIT-FOR-TAT (TFT). TFT never beats its partner in within-group interactions. It only loses when paired with defecting strategies or draws when paired with cooperative strategies. To find the selective advantage of cooperative strategies, we must compare relative fitness at the level of the groups of size n. In two-person evolutionary game theory, for example, pairs of TFT outproduce mixed TFT-ALLD pairs, which in turn outproduce pairs of ALLD.

N-person evolutionary game theory is a tinker-toy model of social evolution in large populations subdivided into ephemeral groups of size n. A diversity of models is required to explore the diversity of metapopulation structures in the natural world[7]: groups of longer duration; group composed of genealogical relatives; groups that form on the basis of partner choice; groups where all members disperse at periodic intervals; groups that reproduce by fissioning; groups where most of the dispersal is between neighboring groups; group where only one sex disperses; groups with fuzzy boundaries; groups that compete indirectly; groups that compete by direct warfare. Every set of assumptions alters the outcome of multilevel

[6] Interpreted from a MLS perspective by Wilson and Sober (1994) and Sober and Wilson (1998).
[7] This is similar to Savage's (1954) distinction between small worlds and large worlds discussed later.

selection in important ways but does not alter the basic fact of multilevel selection. It is on this basis that D.S. Wilson and E.O. Wilson wrote their 2007 article titled “Rethinking the Theoretical Foundation of Sociobiology”, which ended with the words “Selfishness beats altruism within groups. Altruistic groups beat selfish groups. Everything else is commentary.” (Wilson & Wilson, 2007, p.345).

Human evolution from a MLS perspective

Individualism is axiomatic about the individual organism as the fundamental unit of analysis. In contrast, MLS theory is not axiomatic about the unit of functional organization, which depends upon the balance between levels of selection. In addition, MLS theory is capable of detecting the absence of functional organization, such as cases of drift, byproducts, mismatches, and so on. Hopefully, the reader is beginning to appreciate how these foundational ideas might apply to the study of economic systems as functionally organized human constructions. To proceed further, it is necessary to explain how our species evolved the capacity to create such cultural constructions in the first place. The key is to appreciate that before we could become *cultural*, we needed to become *cooperative*.

Despite sharing 98% of our genes with chimpanzees, there is a night-and-day difference in the degree of cooperation. Chimpanzee communities exhibit a little cooperation and a lot of disruptive competition. Naked aggression is over 100 times greater than in small-scale human societies. Even cooperation typically takes the form of alliances competing in a disruptive fashion against other alliances within the same community. The main context for community-wide cooperation is solidarity against other chimpanzee communities (Boehm, 1999; Wrangham, 2019). In laboratory experiments, chimpanzees are so disinterested in each other’s welfare that, when given a choice between a reward for themselves versus the same reward for themselves plus a reward for another chimpanzee (similar to behavioral economics experiments performed on humans), they are indifferent to the choice (Silk et al., 2005).

Something happened during the evolution of our species that resulted in a quantum jump of cooperativity. That "something" was in large part social control. Our distant ancestors found ways of suppressing bullying and other forms of disruptive self-serving behaviors within small groups (Boehm, 1993, 1999, 2011). Increasingly, this is being studied as a form of self-domestication, similar to the domestication of our animal companions (Hare & Woods, 2020; Wrangham, 2019).

In terms of MLS theory, social control suppressed disruptive within-group selection, making between-group selection the primary evolutionary force – although only at the scale of very small groups. At this point in human evolution, there was no context for the evolution of cooperation at larger scales. This is called a major evolutionary transition (MET) and it is similar to other transitions in the history of life, such as nucleated cells as cooperating bacterial cells, multicellular organisms as cooperating nucleated cells, and even the origin of life as cooperating molecular reactions (Maynard Smith & Szathmary, 1995, 1999)[8].

To say that we are a strongly group-selected species at the scale of small groups does not imply that within-group selection was entirely suppressed. Even multicellular organisms are afflicted with cancer after billions of years. Human social control mechanisms are like an immune system that protects against "cancerous" self-serving behaviors – always vigilant, often challenged, and sometimes overwhelmed.

A corollary is that part of the human behavioral repertoire is to operate in "cancer" mode in addition to "solid citizen" mode, depending upon the context. Because individuals operate in multiple group contexts, they can even operate in both modes simultaneously.

Despite these complexities, group selection during our genetic evolution resulted in an increase of cooperativity in all its forms, both mental and physical. Physical forms of

[8] Human major transitions are related to the general concept of major transitions in a series of online conversations titled "The Science of the Noosphere": https://humanenergy.io/projects/science-of-the-noosphere/.

cooperation included hunting, gathering, childcare, modification of the physical environment, defense against predators, and offense and defense against other human groups. Mental forms of cooperation included perception, memory, decision-making, the formation of norms enforced by punishment, and a capacity for symbolic thought vastly greater than any other species (Deacon, 1998; Jablonka & Lamb, 2006).

The degree to which cooperative social interactions have become embedded in our brains and bodies as individuals is only beginning to be appreciated by psychologists, neuroscientists, and health scientists (Beckes & Coan, 2011; Coan & Sbarra, 2015; Gross & Medina-Devilliers, 2020; Shteynberg et al., 2020; Wilson & Coan, 2021). Consider that our ancestors *never* lived alone. They *always* lived in small and for the most part highly cooperative groups – even when those groups were warring against other human groups. This means that individuals always had social resources to draw upon in addition to their own resources. In a food shortage, for example, there were other people to share their food in addition to one's own fat stores. The human brain and body evolved to integrate both personal and social resources in making their myriad tradeoff decisions, such as what to remember, what to pay attention to, or how much energy to allocate to one's immune system. Most of these tradeoff decisions take place beneath our conscious awareness, similar to the unconscious regulation of our breathing and heartbeats.

It follows that to live as an isolated individual in modern times is one of the biggest evolutionary mismatches imaginable. Our brains and bodies react to the absence of social resources as an emergency situation. Our minds struggle to regulate our thoughts and behaviors without the social reinforcement that comes naturally in small cooperative groups, at least when they are appropriately structured. The single most therapeutic action that can be taken by isolated individuals is not to seek therapy as individuals but to seek membership in

small and appropriately structured groups with meaningful objectives, as we will show in our second companion article (see also Wilson & Coan, 2021).

To summarize, while the orthodox economic paradigm begins with the portrayal of human individuals as autonomous units and must struggle to incorporate anything social, MLS theory begins with a conception of the human individual as inherently part of cooperative groupings. This does not mean that individuals lack agency within cooperative groups. To the contrary, since bullying and other forms of disruptive self-serving behavior are the greatest threat to cooperative enterprises, group members must always be ready to assert their own rights. Hunter gatherer-egalitarianism is a combination of stubborn independence and communal values. Members take an active role in deciding what "we" should do, abide by the norms that are created, and punish those that don't. The very same members can be quick to game the system when opportunities allow.

Nowhere is the communal nature of human society more on display than our capacity for cultural evolution. Other species have cultural traditions, including so-called "lower" animals such as fish and birds in addition to the so-called "higher" primates (Laland, 2017; Whiten, 2021). But only humans are cooperative enough to maintain an inventory of symbols with shared meaning and to transmit the inventory in a cumulative fashion across generations. It is notable that the only other outstanding example of symbolic communication in nature – the waggle dance of the honeybee – evolved in another ultra-cooperative species.[9]

Once the human capacity for symbolic thought was sufficiently developed, it resulted in a new process of evolution – cultural evolution – that evolved by genetic evolution and has been coevolving with it ever since (this is called dual inheritance theory: Boyd & Richerson, 1985; Richerson, 2017; Richerson & Boyd, 2005).

[9] See Gowdy and Krall (2015) for an informative comparison of humans and other ultrasocial species.

Genetic evolution is so slow relative to cultural evolution, that – with the exception of genetic engineering – we can ignore it from a public policy perspective, focusing exclusively on cultural evolution. In this regard, however, a comprehensive knowledge of genetically evolved mechanisms of cultural transmission is desirable. It is sobering to reflect that every cultural adaptation worth wanting, including those winnowed from the past and those that we bring about in the present, must somehow be replicated in the minds of others, including children during their development. Conscious attempts to manage economic systems must include the entire culture, not just the institutions and market processes that are the typical targets of economic policy.

Because cultural evolution is much faster than genetic evolution, it enabled our ancestors to spread throughout the planet, adapting to all climatic zones and dozens of ecological niches. Then the ability to produce our own resources (agriculture) and access previously untapped sources of energy (fossil fuels) led to an increase in the scale of human society, leading to the megasocieties of today[10].

Of course, symbolic thought can operate on behalf of disruptive lower-level selection in addition to higher-level selection. Human cultural evolution is a multilevel process, no less than genetic evolution. Cooperation at any given scale is vulnerable to disruption from within (the social equivalent of a cancer) and itself can be disruptive at larger scales. Self-preservation is a good thing – until it becomes self-dealing. Helping family and friends is a good thing – until it becomes nepotism and cronyism. Growing a nation's economy is a good thing – until it overheats the earth. In this fashion, much that is called pathological and corrupt at higher scales is virtuous as smaller scales – merely a CAS2 system rather than a CAS1 system.

[10] Recent research in archeology and paleoanthropology suggests that some hunter-gatherer societies achieved a large scale before the advent of agriculture and that agriculture evolved in the context of large-scale hunter-gatherer societies (Graeber & Wengrow 2021). These new discoveries require a MLS account, no less that the previous understanding of agriculture as the start of large-scale societies.

A new breed of historian is reinterpreting human history from a cultural MLS perspective (Henrich, 2015, 2020; Nunn, 2021; Turchin, 2005, 2015). As a striking example, Josiah Ober, professor of political science and classics at Stanford University, explicitly compares the Greek city-states (poleis) to ant colonies and attributes the remarkable efflorescence of culture during Greece's classical period to the establishment of democratic governance within some poleis, giving them an advantage in economic and military competition against other Greek poleis and adjacent empires (Ober, 2015; Ober & Wilson, 2021).

What took place in ancient times is also taking place in the present (Acemoglu & Robinson, 2012; Fukuyama, 2012a,b; Putnam, 1992). Authors trained in the humanities and social sciences, especially the "New Institutional Economics" pioneered by Douglas North, are increasingly appreciating the value of MLS theory (Nunn, 2021). They are joined by authors such as Peter Turchin (2005, 2015, 2016) and Joseph Henrich (2015, 2020), whose primary training is in evolutionary science.

This completes our whirlwind tour of basic evolutionary principles. In the following sections, we will show how the multilevel paradigm can provide a new foundation for economics.

Core features of the multilevel paradigm

The distinguishing characteristics of the multilevel paradigm for economics may be understood straightforwardly in terms of the Darwinian triad of variation, selection and replication.

Variation comes in many forms relevant for economic activities: innovation, discovery, creativity – which have an intentional component – and the myriad other unforeseen disruptions in the natural, social, political and economic worlds that affect

economic decisions. These economic disruptions are generally not to be understood as "disturbances" or "perturbations" whose properties can be probabilistically determined. Rather, they are manifestations of an uncertain world. The nature of these economic disruptions is as unforeseeable as mutations are in biology.

Economic **selection** is the process whereby populations of economic agents adapt to changing economic circumstances. This adaptation process leads to the preferential survival and transmission of particular motives, ideas, heuristics, norms, values, and institutions that bear on economic decision making – which may be called economic "phenotypes"[11] and "symbotypes."[12] In the multilevel paradigm, the selection process can take place at various levels of functional organization (such as individuals and groups) as well as various domains of functional organization (such as the natural, social, political and economic domains). Correspondingly, economic decisions are made at various levels and domains of agency. Differences in the survival and transmission chances of the economic phenotypes and symbotypes lead to differences in their proliferation in a particular environment (natural, social, political and economic). Since natural selection operates over very long time spans, economic selection is to be understood as artificial selection, which is to be understood as analogous to selective breeding (the human identification of desirable traits in plants and animals). The drivers of economic selection are the objectives of individuals and social groups, arising from the sources of individual and collective wellbeing.

Replication in economics pertains to the transmission of economic phenotypes and symbotypes. It comes in many forms, such as imitation and various forms of inertia. Many of the latter have been identified in behavioral economics, such as status quo bias, loss aversion,

[11] Economic phenotypes are observable characteristics of economic agents, covering the agents' behavioral patterns.
[12] Economic symbotypes are networks of symbolic relations – networks of ideas, norms, values – that regulate economic behavior and thereby shape economic behavior patterns. They are the cultural analog of genotypes in dual inheritance theory. See Wilson et al. (2014).

the endowment effect, and reference-dependent preferences. The persistence of social norms (that may be driven by the forces of conformity and habit) and the persistence of institutions (that may arise from external rewards and punishments generated by these institutions) are further examples.

In the multilevel paradigm, these processes of variation, selection and replication take place within living systems. It is within these systems that different levels and domains of selection may be identified. On this account, the multilevel paradigm is inherently wedded to systems thinking – a paradigmatic departure from individualism.

In particular, the economy is understood as embedded within other domains of living interactions, as shown in Figure 1.

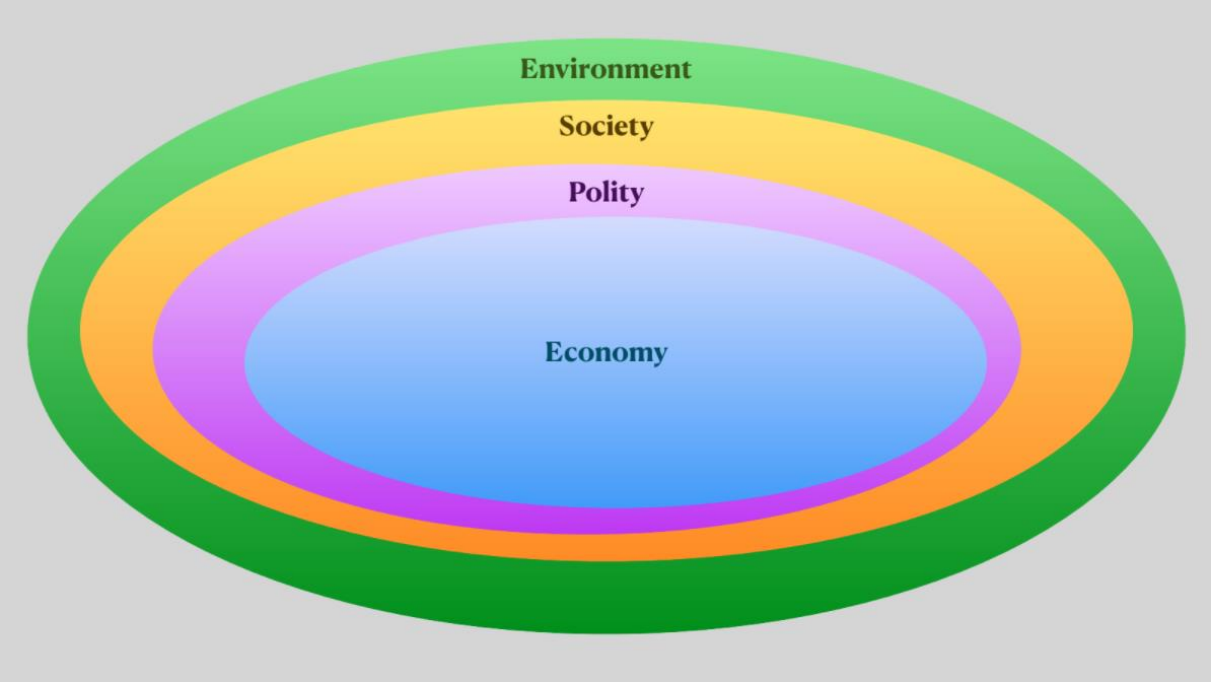

Figure 2: The Embedded Economy

The broadest domain is the "**environment**," the natural world, within which all human activities take place.

Within this context lies the second domain, "**society**," the aggregate of all groups of people living in persistent interactions with one another. These social groups may be small (such as families) or large (such as nations), and they may comprise groups of groups. Most broadly, society may be conceived as the sum total of all human relationships.

In the absence of society, there are no interactions among people and consequently no political or economic interactions either. Different cultures are associated with different social interactions, which generally imply different political and economic interactions. This explains why there is more economic exchange among people who trust one another than among those who don't.

The third domain is "**polity**," the aggregate of all organized forms of institutionalized social relations that involve allocating power and mobilizing resources. It refers to groups of people organized for governance and refers to "a distinctive form of rule whereby people act together through institutionalized procedures to resolve differences, to conciliate diverse interests and values and to make public policies in the pursuit of common purposes" (Crick, 1972. Polity arises from society. Without groups of people living in persistent interaction, there would be no need for polity. In particular, polity is the subset of social interactions involving institutional relations to allocate power and mobilize resources.

Polity sets the rules whereby economy functions. These rules determine the channels whereby production, distribution, consumption and exchange take place. The most basic rules governing a market economy are laws of property, contract and crime. Since these and other economically relevant rules differ across countries, the market economy tends to function differently in different countries.

In the absence of polity, we have "failed states," where laws of property, contract and crime are not observed. Under these circumstances, the market economy cannot function, since powerful, selfish people will prefer to appropriate resources rather than conduct voluntary exchange. (Theft is not even definable in the absence of property rights.)

The final domain is "**economy**," the aggregate of all social relations involving the production, distribution, consumption and exchange of goods and services. The exchange generally occurs through a medium of exchange (money). A market economy is one where the exchange is voluntary, in accordance with the demands and supplies of the economic decision makers.

The multilevel paradigm recognizes that selection can take place at any level of this set of embedded domains. With regard to economic decisions, it is particularly important to recognize that all economic decisions are embedded within the social domain. Economic transactions take place in the context of social networks. When these networks are broken – such as when trust collapses or when conflict breaks out – the economy suffers. When the economy generates great disparities of income, wealth, empowerment and social embeddedness, the society suffers and that, in turn, hurts the economy. The two-way relation between society and economy is essential for understanding economics.

Within these embedded domains, the multilevel paradigm takes seriously the fact that humans are living creatures, not inert machines. It aims to undo the misconceptions that arose when mainstream economics sought to portray human behavior in terms of the mechanical rules of physics rather than the adaptive principles of biology. There are many constructive lessons that economics can learn from multilevel evolution in biology.[13] Like biological systems, economies are complex, adaptive systems, evolving through the forces of variation (innovation), selection (multilevel decision making) and replication (cultural transmission). These principles underlie behavior of learning organizations that adapt to their environment (e.g., Hall, 2005). Like biological systems, economic systems are modular hierarchical structures (as explained by Simon (1996) as well as Beer (1995) and Booch (2007)). Biological systems depend on homeostasis to deal with external perturbations and internal

[13] We are deeply indebted to George Ellis for highlighting these lessons.

problems that may arise; the role of homeostasis in economic decision-making deserves further attention (Damasio, 2016). Like biological systems, economic systems depend upon predictive processing of information (Clark, 2013).

Needless to say, however, all these analogues are emphatically not meant to imply that economies are to be understood as biological systems. There are aspects of the economy that have no parallel in biology. In particular, money, prices, anonymous (or rather quasi-anonymous) transactions have no direct parallels in the biological world. Instead, the analogues above are meant to highlight that every economy is embedded in a polity, society and natural environment. These settings are populated by humans and other living things, whose behavior is to be understood as part of living systems, not mechanical physical systems. In this regard, the well-known "physics envy" of economics is gravely misplaced.

On the basis of the considerations above – the Darwinian triad (variation, selection and replication) operating within living systems – we can identify four prominent features of the multilevel paradigm:

1. **Multiple, flexible levels of functional organization**, covering economic embeddedness.
2. **Primacy of social relations**: enabling people to operate at higher levels of functional organization.
3. **Uncertainty**, arising from the economic aspects of variation.
4. **Multilevel sources of wellbeing and progress**, which are drivers of selection and transmission.

On this basis, the gist of the multilevel paradigm may be summarized as follows. Economics cannot be understood as a self-referential intellectual silo. Instead, economic activities are embedded in the natural world, subsisting from it and transforming it. They are also embedded in society (conceived as the sum of all interactions among humans) and polity

(conceived as the subset of social interactions dealing with the allocation of power). Some of the social interactions, taking place within the rules of the polity, can be anonymized sufficiently to become economic transactions. Over the past three centuries, a wide variety of non-economic social interactions have been transformed into economic activities.

The evolution of economic activities can be understood in terms of the economic counterparts of variation, selection and replication, namely: stochasticity, multilevel selection and cultural transmission. First, stochasticity covers all events that cannot be foreseen probabilistically, such as technological innovations (had they been foreseen, they would have occurred earlier). It is on this account that our ignorance involves uncertainty. Second, multilevel selection involves selecting outcomes or planned outcomes from the stochastically available alternatives. In the domain of people, the unit of selection may be the individual or a diversity of social groups nested within each other. The group can become the unit of selection when individuals – driven by internal mechanisms (such as moral values) and external mechanisms (such as institutions) – cooperate consistently in the pursuit of collective purposes. Levels of selection may change through time since humans are flexible in their ability to pursue individual and collective goals. Third and finally, cultural transmission involves the spread of selected ideas, intentions and behaviors, enabling people to acquire skills that they could not have developed over the course of their own lifetimes. Thus, skills are also located at various levels of functional organization. The processes of selection and transmission help people adapt to ever-changing circumstances.

Human well-being is the product of selection and replication, in response to variation. Our wellbeing is multifaceted (covering material, agentic and communitarian needs and purposes) and context-dependent (so that the relative salience of our various individual and collective goals depends on our physical and social contexts). Consequently, it is not useful to integrate all components of wellbeing into a single metric and progress should be assessed not

just in terms of economic growth, but also in terms of meeting our needs for empowerment, social solidarity and sustainability.

The multilevel paradigm requires us to rethink the purpose of economics, to which we now turn. We then proceed to consider each of the five distinguishing features of the paradigm in greater detail.

Rethinking the purpose of economics

Rethinking the theoretical foundation of economics calls for a redefinition of economics, associated with a new specification of its purpose. We propose that economics be defined as *the discipline that explores how resources, goods and services can be mobilized in the pursuit of wellbeing in thriving societies, now and in the future.* We do not claim that this definition is entirely new, but rather that it leads to a different mental "basin of attraction" than the conventional definitions, which are based on Robbins famous definition of economics as "the science that studies human behavior as a relationship between ends and scarce means which have alternative uses" (Robbins, 1932, p.15).

The pursuit of wellbeing in our definition is to be conceived broadly, taking into account all human needs and purposes – insofar as they are relevant for the mobilization of commodities (resources, goods and services). The conceptual tools developed for this purpose may be expected to have more general validity for analyzing social systems beyond economics.

Needless to say, human beings have needs and purposes other than consumption, which also call for the mobilization of commodities. Beyond that, we have needs and purposes that extend beyond our self-interest and even our "enlightened self-interest" (the self-interest that takes social forces such as direct and indirect reciprocity into account).[14]

[14] Such enlightened self-interest may support prosocial behaviors, such as people seeking the "warm glow" from philanthropic activity or pursuing social preferences. In these cases, individuals are helping others as by-product

Human beings are social animals that have achieved great success as a species in the evolutionary process through their abilities of cooperation, innovation and niche construction (Odling-Smee et al., 2003). We cooperate in greater numbers than other mammals, enabling us to transmit knowledge from their innovations across time and space. Our cognitive abilities, combined with our ability to transmit knowledge, have made us particularly adaptable to changes in our environment. Our ability to shape the physical and social environment in which we live – constructing niches through new technologies, institutions, norms, values and identities – has enabled us to adapt our environment to our own needs.

On account of the important role that cooperation has played in our evolutionary success, it is not surprising that we have not just individual needs, but also social ones. Behavioral economics has made an important contribution by inducing economists to take "social preferences" seriously. The multilevel paradigm, as we will see, takes our understanding of such social preferences further by exploring how they arise and evolve at higher levels of functional organization.

Our social needs manifest themselves proximately in a variety of psychological motives, ranging from cooperative motives such as care (seeking to promote the wellbeing of others and to alleviate the suffering of others) and affiliation (seeking to belong to social groups) to competitive and conflictual motives such as status seeking (looking for positional advantage), power (seeking influence over others), threat avoidance (felt through fear) and threat approach (felt through anger).

Insofar as our evolutionary success builds on our capacity for innovation and niche construction, it is not surprising that we have a fundamental need for agency, i.e. a sense of empowerment derived from shaping our environments. This need is manifest proximately in an achievement motive (pursuing excellence with regard to specified goals), which is usually

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of their individualistic utility-maximization. They are not participating in the ends of their groups, generating group dynamics that shapes their collective goals.

operative within a social setting. To gain satisfaction from achievement, the underlying goals usually need to be recognized as significant by other people within one's social reference group.

Understanding our needs in terms of our psychological motives is an important step towards rethinking the purpose of economics. The multilevel paradigm recognizes that all behavior is motivated. "Motivated decision making" is a central insight of caring economics developed by Tania Singer and Dennis Snower (Singer & Snower, 2015) and applied to economic decision making in Bosworth, Singer and Snower (2016). Different social and physical contexts prime different motives, which are associated with different objectives, perceptions and beliefs.[15] As noted, many of our motives are social, enabling us to cooperate and compete with one another. Both cooperation and competition can take place at levels of functional organization higher than the individual. Much of human sociality can be understood in terms of decision making at these higher levels of functional organization.

Since we are social creatures, our wellbeing must be understood in the context of thriving societies. Though some human needs and purposes are individualistic (relevant only to the individual in isolation from other individuals), most are collective (relevant to the individual with reference to the individual's place within social groups). Care, belonging, status-seeking, exercise of power, and much of achievement are objectives that are inherently social. This means that the individual's decisions cannot be understood independently of the individual's position within social networks. Thus, the individual is not the exclusive entity of functional organization. Not only the individual's objectives, but also the group's objectives – defined in terms of its purposes, values and norms – are relevant for behavior. Human sociality also means that wellbeing is not just an individualistic phenomenon, but a collective

[15] For empirical evidence, see for example Bartke, Bosworth, Chierchia and Snower (2019) and Chierchia, Parianen-Lesemann, Vogel, Singer and Snower (2017).

one as well. Thriving societies, in which people enjoy fulfilling interpersonal relations, are an important source of wellbeing.

Thus, economics is concerned not just with economic incentives (such as prices, wages and profits), but also with social and political incentives, because all these incentives are relevant to the mobilization of commodities. Thereby our definition creates new boundaries of the economics discipline vis-à-vis the other social sciences.[16]

Economics in our definition focuses on wellbeing not just for the present generation, but also for future generations as well. Accordingly, economics is meant to help us examine how commodities can be mobilized to achieve sustainability in many respects – living within sustainable economic, social, political and ecological systems (as summarized in the Sustainable Development Goals, for example). Economics must be concerned, for example, with the question of whether the allocation and distribution of resources resulting from the forces of globalization, automation and financialization lead to economic instabilities (such as financial crises), social fragmentation (such as the weakening cohesiveness of communities) and political fragmentation (such as declining trust in political institutions and declining willingness to seek compromise in the political process). Economics must also examine whether the allocation and distribution of resources is compatible with planetary boundaries.

On all these accounts, economics must be connected with other social and natural sciences, because the mobilization of commodities in the pursuit of wellbeing involves much more than economic markets. Our redefinition of economics implies that the purpose of the economy is to serve society, where individuals derive many of their capacities and objectives through the interactions with one another.

In the light of this redefinition of economics, we now consider the five central features of the multilevel paradigm.

[16] The boundaries among the social sciences often overlap, so that a particular set of behaviors may be analyzed in different ways by different disciplines.

Flexible, multiple levels of functional organization

Our point of departure is simple: whereas non-living physical systems can be studied mechanistically, living systems must be understood as *adaptive* and adaptation can take place at various levels of functional organization.[17] The humans that populate economies are living things in the process of adaptation. The selection of adaptive behavior patterns – as well as adaptive psycho-social mechanisms generating these behavior patterns – can take place at the level of individuals or social groups. Since humans are social creatures, most of our behavior patterns are in fact shaped by our group allegiances. On this account, both individuals and social groups have important roles in economic decision making.

Homo sapiens differ from other animals in terms of the extraordinary flexibility of our functional organization. We are able pliant creatures, able to switch our allegiances and our understanding of ourselves, as individual agents and as members of social groups. On this account, we are able to belong simultaneously to a plethora of social groups, within each of which we have different functions, defined by our social roles in these groups. We have used this flexibility to our evolutionary advantage; it has enabled us to populate all corners of the earth and adapt to a plethora of challenges, many of which we have created ourselves in the process of niche construction.

This means that our levels of functional organization may be understood as solutions to problems of cooperation. Some of the challenges we face require little cooperation and we can address these as individuals. Other challenges require the cooperation of particular constellations of individuals performing particular functions with respect to particular environmental stimuli. With regard to these, we can form the requisite social groups.

[17] This point of departure differs from the conventional economic approach of modelling economic agents mechanistically, assuming that the individual is the only operative level of functional organization, and representing the economy like a giant machine responsible for the circular flow of income and product.

Our sense of social belonging within these groups may be understood as a psychological mechanism promoting intrinsic incentives for group cohesion. In addition, we produce extrinsic rewards for other group members to comply with group norms and extrinsic punishments for norm violators. Many of our institutions, laws and regulations can also be understood as extrinsic incentives to promote group cohesion around higher levels of functional organization. It is important to emphasize that these intrinsic and extrinsic incentives can be used flexibly to enable humans to operate at multiple levels of functional organization, depending on the challenges that they face. Challenges that can be addressed individually induce us to act individualistically; collective challenges may be addressed collectively by operating at the level of the social group as decision-making entity (provided that the intrinsic and extrinsic incentives are able to overcome free-riding).

It is this flexibility in the levels of functional organization that is missing in the prevailing models of household economics. In Becker's unitary model of the household (Becker, 1981), for example, the household maximizes the utility of an altruistic member. In Chiappori's collective model (Chiappori, 1992), household decisions are either cooperative (efficient with regard to its individual members) or non-cooperative (resulting from a Nash equilibrium in which the members first share their nonlabor income in accordance with a predetermined sharing rule and then make their own labor supply and consumption decisions). In these and other conventional models of household behavior, there is no flexibility of functional organization: the household members operate as individuals, who may be altruistic or bargain individualistically with one another. By contrast, under flexible, multiple levels of functional organization the individual, the entire household or a subset of the household may be the decision-making unit, depending on the social and physical context. The context determines the internal and external incentives for pursuing individual versus collective goals.

The same lack of flexibility in the levels of functional organization is to be found in the conventional theories of the firm, from the transactions cost models (e.g., Coase, 1937; Williamson, 1975) to the principal-agent models (e.g., Spence & Zeckhauser, 1971) to the satisficing models (e.g., Cyert & March, 1963) to the contract models (e.g., Grossman & Hart, 1986; Hart & Moore, 1990). In these models, managers dictate the behavior of the firm, subject to transactional, informational, cognitive and contractual constraints. In the multilevel paradigm, the owners, managers and employees of the firm can operate at flexible, multiple levels of functional organization, depending on the social and physical environment of the firm.

Another way of understanding the multiple levels of functional organization that humans can flexibly inhabit is through identity economics, which represents a major conceptual breakthrough in examining the implications of social identities for economic activity (Akerlof & Kranton, 2010). In what we may call the "Lineaus phase" of identity economics, important social groups were identified and classified with regard to their economic functions.[18] The objective of this analysis was to show that social identities matter for economic behavior. This was followed by what we may call the beginnings of identity economics' "Darwinian phase," the functions of social groups were analyzed as solutions to problems of cooperation, such as challenges in education (Akerlof & Kranton, 2002), the workplace (for example, Akerlof & Kranton, 2008) and other organizations (for example, Akerlof & Kranton, 2005). Further contributions investigate challenges addressed by religions (for example, Carvalho, 2013), ethnicities (for example, Bodenhorn, 2003), classes, nations and other social groupings. These are important steps towards a fuller understanding of roles that higher levels of functional organization play in economic, social and political activities.

[18] Akerlof (1976) and Akerlof and Kranton (2000) can be interpreted as representing aspects of this phase.

Yet another approach to multilevel functional organization is offered by the principle of biological relativity (Ellis & Noble, 2021; Noble 2012; Noble, 2016; Noble & Noble, 2020), whereby there is no privileged level of causation in the emergent hierarchy of life, from atoms to social groups and ecosystems. At each level there is bottom-up stochasticity and top-down causation through which higher-level objectives guide the selection of lower-level outcomes. Within this system of causal loops, concepts, ideas and social groups have causal roles. In the presence of stochasticity, sure decisions (based on a complete understanding of the options and the relation between means and ends) is impossible. Thus attention, perception, intuition and imagination play important roles in the selection of perceived options. Emotions play a key role in guiding our reason (for example, Damasio, 1994), communicating our affective states to others, and even in maintaining homeostasis (Ellis & Solms, 2017). Due to the human flexibility in switching among levels of functional organization, social groups can be represented as either a higher level of functional organization or as a "surrounding influence" (Ellis & Noble, 2021).

The primacy of social relations

The multilevel paradigm views economic relations as a subset of social relations. Social relations are conceived as the sum total of all interactions among humans, whereas economic relations pertain to that subset of social relations which can be anonymized sufficiently to permit contractual relationships to be specified independently of personal identities. In other words, economic activities may be understood as special kinds of social relations. Many economic activities have both transactional and social-relatedness components. Economies are firmly embedded within societies (see, for example, G. Akerlof, 2007; G. Akerlof & J. Yellen, 1990; R. Akerlof, 2017).

Socially embedded economic activity

Embedding a standard economic model into a model of social relations can be shown to have dramatic consequences. In particular, Fleurbaey, Kanbur and Snower (2021a) embeds a Walrasian general equilibrium model into a Nash model of society. In this framework, the fundamental theorems of welfare economics lose their relevance, new notions of efficiency and equity are called for, various market failures can be overcome through social relations, various social rigidities can be overcome through economic relations, reducing inequality may enhance socio-economic efficiency, economic and social cooperation may be mutually self-reinforcing, and much more (see Fleurbaey, Kanbur & Snower, 2021a).

Conceptually, there are a variety of other ways to embed economic activities into social interactions. Gintis (2010) uses the concept of a "choreographer" (who sends signals to the social actors to produce social norms that generate a correlated social equilibrium, in the spirit of Aumann (1987)) through models that use decision, evolutionary and game theory extended to encompass other-regarding preferences (Gintis, 2007). Gintis (2017) extends the notion of subjective prior in the rational actor model to explore how human minds become networked, making cognition distributed across minds. Bowles and Gintis (1988, 1993) examine how incomplete contracts lead to moral relations and power relations that influence the legitimacy and trust underlying economic activities. The multilevel paradigm adds the notion of flexible, multiple levels of functional organization as central characteristic of the social soil in which economic activities emerge.

The cultural approach to economics (e.g., Alesina & Giuliano, 2015; Algan & Cahuc, 2010; Hoff & Pandey, 2006; Hoff & Stiglitz, 2010; Tabellini, 2010) promotes an appreciation of the deep-seated and far-reaching interactions between culture and the economy. In particular, Hoff and Stiglitz (2016) explore how culture influences our cognition and perception, and vice versa. This helps explain widespread empirical evidence of such a reflexive relation, e.g., why repeated social interactions in group lending lead to increased

trust (Feigenberg et al., 2013), why exposure to local female leaders changes attitudes towards female leadership potential, leads to a rise in the number of women running for office (Beaman et al, 2009), why Chinese rice farmers (who have to cooperate intensively) tend to categorize objects with reference to their interactions whereas wheat farmers (who can cultivate their plots independently) tend to categorize these objects in terms of object-related principles (Talhelm et al., 2014), and why Westerners – who tend to be more individualistic than East Asians – tend to explain sports outcomes more in terms of individual characteristics, while East Asians tend do so in terms of contextually (Nisbett & Masuda, 2003).

Though Hoff and Stiglitz describe their analysis of "enculturated decision making" as "behavioral economics, strand two," we consider the "enculturated actor" and other contributions to cultural economics to be a significant step towards the new paradigm that is described here, taking their approach beyond the standard behavioral economics framework where preferences, whether individual or social, are located in the individual. This approach does not merely ascribe heuristics and biases in decision making to "fast thinking" that is hard-wired in our minds, but rather links our understanding of the world to our cultural characteristics. The Hoff-Stiglitz approach also goes beyond the "social knowledge" underlying economic choices (Arrow, 1994), since the approach also encompasses perceptions and identities.

The multilevel paradigm takes this approach further through an explicit consideration of multiple levels of functional organization, a multilevel appreciation of social interactions, and an explicit connection between radical uncertainty and motivated, value-laden decision making. The multilevel paradigm does not view people as swimming in an ocean of culture, but rather embedded in intricate social networks, which are shaped not just by persistent cultural characteristics, but by emergent, adaptive relationships involving overlapping social groups and associations of groups. Here social influences go beyond trait-like norms and also encompass state-like social motives that can change abruptly in response to changing social

interactions. Here individuals are not only *enculturated actors*, but also *motivated actors*, who are capable of both individual and collective motives, where the collective motives make individuals capable of higher levels of functional organization. The culture that is embedded in enculturated actors rests on both external mechanisms (rewards and punishments regarding specific behavior patterns) and internal mechanisms (such as personality traits reinforced by the external mechanisms). Since personality traits may be understood as crystallized motives (i.e., motives that have been activated frequently in the past)[19] and the external cultural mechanisms are responsible for crystallizing particular motives, it is clear that motivated actors (whose motivational states can change flexibly in response to changes in the environment) can become enculturated actors (whose traits reflect the prevailing culture).

Over the course of history, humans have discovered endless ways of moving from socially determined barter relations to economic transactional relations. These moves have been accompanied by substantial productivity gains, since economic transactions are far more flexible than social relations, which rely heavily on principles of reciprocity and a variety of social norms. In the process, however, something is frequently also lost, since social relations often arise to address collective challenges, such as overcoming negative externalities and inequities arising from economic relations.

Moral values in economic activity

Moral values may be understood as a central feature of multilevel functional organization in humans. Due to the human flexibility in shifting across different levels of functional organization, there is an ongoing conflict between individual-level selection (with individuals competing with one another in each social group) and group-level selection (with groups competing with one another). The former is responsible for selfishness and greed; the latter promotes tolerance, respect, care, altruism and other forms of cooperation beyond enlightened

[19] See, for example, Bosworth, Singer and Snower (2016), Deci and Ryan (2012), and Little (1999).

self-interest – primarily within the relevant social groups. An essential purpose of moral values is to promote intrinsic cooperation within groups and suppress destructive selfishness.[20]

Many of our virtues can be recognized as supporting our positive regard for others and most of our vices involve the pursuit of our gain at the expense of others. Even values that appear individualistic – such as achievement and self-direction in Schwartz's value circumplex (Schwartz, 1992) or liberty in Haidt's foundations of morality (Haidt, 2012) – gain their normative force through their support for new ideas ("variation" in the process of cultural evolution) that ultimately benefit society.

The conflict between selfishness and care can also arise at higher levels of functional organization, such as between unions and employers' associations regarding wage formation at the national level or between nations regarding international climate negotiations. Moral values clearly play a major role in helping people address collective challenges, such as public good and common pool resource problems. [21]

Much can be gained by understanding morality in terms of biological (including psychological) and cultural solutions to the problem of cooperation in our social lives. The human flexibility in shifting across different levels of functional organization – together with cultural transmission and improvisational intelligence – have enabled us to design moral systems with the deliberate purpose of promoting cooperation (see Alexander, 1987; Boyd, Richerson & Henrich, 2011; Pinker, 2010). In this vein, morality has several important functions: (i) motivates us to pursue mutually beneficial outcomes beyond enlightened self-interest, (ii) it provides criteria by which we can recognize and evaluate the intentions and

[20] Impressive empirical evidence for this theory, based on ethnographic records of 60 societies, is provided by Curry, Mullins and Whitehouse (2019).
[21] From this perspective, Collier (2018) provides an analysis of the future of capitalism and Mayer (2019) examines the future of business.

behavior of others in terms of such outcomes, and (iii) it motivates us to promote cooperative intentions and behavior in others through policing, rewards and punishments.[22]

Since humans face many different problems of cooperation, they have developed many different moral systems for addressing them. Through our cultural and religious heritage, we have inherited a variety of moralities. Many of the conflicts among these moralities – different virtues, deontological moral precepts, act utilitarianism, rule utilitarianism, and so on – may be resolved by understanding the moralities in context of the underlying problems of cooperation (see Lehmann & Keller, 2006).

This context dependence of moral values is a core feature of virtue ethics, but has been given scant attention in the universalist secular moralities of the European Enlightenment. In the deontological rules focus on the intrinsic rightness or wrongness of actions, usually without regard to context. Consequentialism evaluates actions in terms of their consequences for wellbeing, which is commonly depicted as context-independent (such as the standard, context-independent utility functions of orthodox economics). In practice, however, most people feel drawn to a variety of moral approaches (across the virtue, deontological and consequentialist domains) that conflict with one another and the relative salience of these approaches generally depends on their social context (for example, Fox & Kahneman, 1992).

Since orthodox economics does not consider the social foundations of economic relations, moral values play no essential role in neoclassical and behavioral analyses. In fact, one of the first things that economics students learn is the distinction between "positive economics" (based on propositions that are objective and verifiable, without recourse to moral values) and "normative economics" (based on "value judgments," which turn out to be distributional choices). While the lion's share of conventional economic analysis is devoted to

[22] Fleurbaey, Kanbur and Snower (2021b) analyze moral motives as psychological devices to induce people to cooperate beyond enlightened self-interest, providing intrinsic rewards and punishments.

positive economics, normative choices are portrayed as "preferences" of policy makers. This creates the widespread impression that economics is value-free.

Orthodox economics has insulated itself from moral considerations through a variety of assumptions: (a) It is individualistic, whereas moral principles generally address collective concerns. (b) It is primarily focused on how scarce resources are used to satisfy exogenously given "wants," rather than worthy social goals arising collectively through interpersonal interactions. (c) The object of these wants are commodities, not social relationships with a moral valence.

The multilevel paradigm, by contrast, recognizes that moral values pervade all economic decisions, since they influence the motives underlying our actions, the identification of causal relationships, and the level of human functional organization.[23] They do so through value-driven narratives that help us make sense of our environment, focus attention on particular events and characters, assign social roles and identities, define power relations and convey social norms (see Akerlof & Snower, 2016). These narratives also help us make conditional predictions concerning the consequences of our actions, thereby giving us the conviction to act (see Tuckett & Nikolic, 2017). Values play an important role in generating conviction, since values evoke emotions, influence the degree to which a narrative reduces anxiety, shape our perception of the plausibility of the narrative, and affect our trust in others who believe in the narrative – all significant determinants of the degree to which we are convinced of the conditional predictions underlying our actions. As these convictions arise within social networks, the underlying narratives spread through such networks as well (see Shiller, 2019).

[23] For seminal work in this area, see for example Gintis (2017) and Bowles (2016).

Values as motivators: In orthodox economics, values can affect behavior only via an individual's utility function and thus values are indistinguishable from tastes. For example, it makes no difference whether my disinclination to kill arises from a moral imperative or an aversion to seeing blood; both are simply sources of individual preferences.

The new paradigm acknowledges that all behavior is motivated (See, for example, Bosworth, Singer & Snower, 2016) – as described in motivational psychology – and that values are drivers of human motives. In the value circumplex of Schwartz (1992, 1994), for instance, the cooperative social motives are associated with the values of benevolence and conformity. The competitive motives are associated, in the Schwartz circumplex, with the value of power. The agency motive is associated with Schwartz's values of self-direction, stimulation and achievement.

The need for consumption, on which all of conventional neoclassical economic analysis is focused, is only one of many human motives – associated with Schwartz's value of hedonism – and there is no reason to believe that this consumption motive is primary. Even the consumption of goods and services often does not generate wellbeing directly, but rather indirectly, as an input into the pursuit of social motives, such as affiliation and agency. The same bundle of consumption goods and services may give rise to quite different degrees of wellbeing, depending on whether they serve cooperative, innovative or niche-constructive goals.

Values in the identification of causal relationships: None of our perceptions are value-free. The reason is that values affect our psychological motives, which shape our attentional field, determining the causal relationships that we identify. For example, the value of love may drive our motive of care, while dishonesty may drive our motive of anger. These motives induce us to attend to quite different aspects of our physical and social environment – the former associated with opportunities to promote the well-being of others and the latter with

opportunities to diminish their wellbeing. The resulting observations are different, since each motive brings distinctive phenomena to our notice and suppressed recognition of others. On this basis, it is not surprising that the observed causal relationships turn out to be different as well.

Particularly in the face of uncertainty – that the new paradigm recognizes as being almost omnipresent – it is clear that our identified causal relationships are not drawn from a determinate "reality" of causal relationships, but are rather human constructs that are meant to enable us to navigate our physical and social environment. This navigation is facilitated by value-driven motives.

Values as drivers of group-level functional organization: As values are also an essential channel inducing human cooperation, they become a distinctive driver of group-level functional organization. Insofar as humans face similar problems of cooperation across cultures – such as in the allocation of resources among kin, coordination to mutual advantage within social groups, reciprocal exchange without free riding, and conflict resolution through hawkish and dovish displays, property rights, and norms of fair resource division (Curry, Mullins & Whitehouse, 2019) – the moral values associated with such cooperation problems can also be expected to have commonality across cultures (Curry, 2016; Haidt, 2012; Joyce, 2006).

Promoting cooperation beyond enlightened self-interest

Whole economic systems are separated from the individual person by a dense network of groups nested within larger groups, with every grouping struggling to become a unit of functional organization and succeeding only to a degree (see also Gowdy & van den Bergh, 2003).

To achieve higher levels of functional organization, humans have created a variety of mechanisms that induce them to cooperate beyond enlightened self-interest[24] by participating in collective entities with collective goals. This ability has been crucial in overcoming a wide variety of collective action problems, particularly when the level of the collective entities was well matched with the level of the collective action problem (e.g. family affiliations to deal with child-rearing issues, national affiliations to address challenges that are national in scope). The mechanisms have been both external (that are "out of the head," such as institutions and laws) as well as internal, (that are "in the head," such as psycho-social motives such as care and affiliation).

From the ancient Greek philosophers, to the Christian apostles, to Enlightenment philosophers such as Thomas Hobbes, to the first architects of the human social sciences such as Emile Durkheim, the metaphor of *a human society as like an organism* was a guiding metaphor for actually constructing such societies. What we can say from a modern evolutionary perspective is that the concept of a human society as like an organism is not obsolete, but requires qualification.

What distinguishes human communities from insect colonies is the flexibility with which humans can switch among various types and levels of functional organization. Whereas honey bees, for example, are invariably groupish, humans may act as individuals in some contexts, affiliate with a wide variety of different social groups (such as those based on religion, ethnicity, gender, nationality, class, race and many other criteria (see, for example, Appiah, 2018) and various levels of aggregation (such as from neighborhood self-help groups to national affiliation). Thus, it becomes important to study both internal and external

[24] Cooperation beyond enlightened self-interest involves cooperative behavior that extends beyond considerations of reciprocity and reputation (indirect reciprocity).

mechanisms that induce humans to act at particular levels of functional organization and to switch from one level to another.

External mechanisms

Regarding external mechanisms that promote levels of functional organization that enable people to cooperate at the scales relevant to their collective challenges, Elinor Ostrom comes closest among Nobel laureates in economics to appreciating the importance of the "meso" scales that link microeconomics (as a study of individual behavior) to macroeconomics (as a study of national or supra-national activity). Her work marks an important step toward a multilevel evolutionary view. Ostrom was a political scientist by training and was awarded the Nobel prize in economics in 2009 for her work on groups that attempt to manage common-pool resources such as forests, pastures, fisheries, and the ground water (Ostrom, 1990, 2010 a, b). These resources are vulnerable to exploitation by members taking more than their fair share, which the ecologist Garrett Hardin dubbed "the tragedy of the commons" (Hardin, 1968). Conventional economic wisdom held that the only solutions to the tragedy of the commons were to privatize the resource (if possible) or impose top-down regulation.

By compiling a worldwide database of common-pool resource groups, Ostrom showed empirically that groups are capable of self-managing their common-pool resources if they implement certain core design principles (CDPs) shown in the first column of Table 1. Later, Wilson worked with Ostrom and her postdoctoral associate Michael Cox to generalize the CDPs from a multilevel perspective, applying them to all collective goods (including public goods as well as commons) (Wilson, Ostrom & Cox, 2013). A generalized version of the CDPs and how they relate to multilevel theory is shown in the 2nd and 3rd columns of Table 1.

Table 1: Generalizing Ostrom's core design principles for the efficacy of groups

Ostrom's Principle	Generalized Version	Function
1. Clearly defined boundaries	1. Shared identity and purpose	Defines group
2. Proportional equivalence of benefits and costs	2. Equitable distribution of costs and benefits	Ensures effectiveness within groups by balancing individual and collective interests
3. Collective choice arrangements	3. Fair and inclusive decision-making	
4. Monitoring	4. Monitoring agreed-upon behaviors	
5. Graduated sanctions	5. Graduated responding to helpful and unhelpful behaviors	
6. Conflict resolution mechanisms	6. Fast and fair conflict resolution	
7. Minimal recognition of rights to organize	7. Authority to self-govern (according to principles 1-6)	Appropriate relations with other groups, reflecting the same CDPs
8. Polycentric governance	8. Collaborative relations with other groups	

CDP1: For a group to function well, there must be a strong sense of identity and purpose. Members must know that it is a group; that the work of the group is valuable and worth doing; the specific objectives; who is a member, and so on. All functionally-oriented groups can benefit from this clarity. Note that CDP1 is intrinsically value-laden, in contrast to the orthodox view that economics can somehow be value-free.

CDP2-6: These principles govern social interactions within the group, coordinating cooperative activities and suppressing behaviors that might benefit members at the expense of the common good defined by CDP1. CDP2 ensures that what members get from the group is proportional to what they contribute. CDP3 ensures that all members take part in decision-making, which protects against unfairness and makes use of everyone's knowledge. CDP4 monitors agreed-upon behaviors so that failures of coordination and lower-level advantage-seeking can be detected. CDP5 brings behaviors back into alignment in a graduated fashion, starting out friendly and non-judgmental and escalating only when necessary. Also, positive reinforcement of good behavior is as important as graduated sanctions against bad behavior. CDP6 resolves conflicts quickly and fairly, since all parties in a dispute typically think that they have a reasonable point of view.

CDP7-8: These principles govern between-group relations. A group must have a degree of autonomy to manage its own affairs (CDP7) and relations among groups (CDP8) must reflect the same CDPs as relations among individuals within groups for cooperation and coordination at higher scales. This concept of polycentric governance (McGinnis, 1999; Ostrom, 2010a,b) reflects the insight that: 1) life consists of many social spheres of activity; 2) each sphere has an optimal scale; 3) good governance requires finding this optimal scale for each sphere and appropriately coordinating among the spheres.

In her study of metropolitan police departments, for example, Ostrom determined that forensic labs could be regional but cops walking the beat should be local so that they can get to know the neighborhoods that they are protecting (Boettke et al., 2013; Ostrom & Parks, 1973). Real-world cultural systems, including economic systems and the larger social systems within which they are embedded, exhibit this kind of polycentric governance to the extent that they are products of system-level selection, due to a combination of intentional planning and blind evolution favoring cultural arrangements that hang together, compared to the many that fall apart.

These core design principles are not meant to be a conclusive or comprehensive summary of measures required to ensure cooperation in the management of collective goods. Rather, they should be treated as work in progress: on the basis of existing evidence, they appear to be necessary conditions for the self-management of collective goods. Nor are they meant to represent a comprehensive list of such necessary conditions. Further conditions may be identified in the future. The core design principles are simply to be understood as a promising point of departure for identifying predominantly external mechanisms[25] to promote cooperation in the public interest.

[25] Only CDP 1 is an internal (in-the-head) mechanism. The rest are external (out-of-the-head).

The principles of federalism and subsidiarity have arisen throughout history because governance at a larger scale is simply impossible without levels of governance at smaller scales (Turchin, 2015). In ancient Athens, the smallest unit was called the deme and consisted of 150-200 free adult males, roughly the size of a single village. The next level of governance combined demes from coastal, inland, and urban areas into a unit called the tribe. These tribes had no historical precedence and were strategically created, along with many other institutions and processes, so that democratic governance could take place at the scale of the whole city state (Ober, 2015; Ober & Wilson, 2021). A similar story can be told for the concept of subsidiarity, in which lower-level units have authority over their affairs unless they cause disruption at higher scales, which arose within the Catholic church and became an important principle in the formation of the European Union (Holmes, 2010).

Internal mechanisms

The internal mechanisms promoting higher levels of functional organization have received much attention in various disciplines, primarily outside economics. These internal mechanisms include mindfulness,[26] mindreading,[27] empathy,[28] perspective-taking,[29] compassion[30] and loving-kindness.[31] There is ample evidence that these mechanisms can all be trained (see, for example, Condon & Makransky, 2020).

Attempts to identify core principles for internal change, analogous to Ostrom's core design principles for external change, are still in their infancy. Some examples include principles of effective altruism (MacAskill, 2016; Singer, 2015), principles of positive psychology (for example, Seligman, 2012), and religious principles such as the Nine Elements

[26] Mindfulness is non-judgmental awareness of one's sensations and feelings.
[27] Mindreading is the ability to understand the mental states of others.
[28] Empathy is the ability to feel the feelings of others.
[29] Perspective-taking is the ability to understand a situation from the perspective of others.
[30] Compassion is concern for the suffering of others and the will to alleviate this suffering.
[31] Loving-kindness is the concern for the wellbeing of others and ability to participate in this wellbeing.

of Universal Spirituality,[32] the Eightfold Path of Buddhism, and widespread religious principles such as "love your neighbor as yourself" (promoting cooperation within social groups), "love the stranger" (promoting cooperation across social groups) and "you shall not covet" (discouraging destructive selfishness). What all these approaches have in common is the promotion of human interconnectedness (such as by expressing gratitude, practicing acts of kindness and nurturing social relationships) and the suppression of conflict within and across social groups (such as by practicing forgiveness). Appreciation of the sacred and transcendent also discourages destructive selfishness and encourages the appreciation of higher levels of functional organization. It is striking that these principles are also the ones that promote happiness (see, for example, Lubomirsky, 2007; Seligman, 2012).

Furthermore, there are important feedback effects between these internal mechanisms (on the one hand) and culture and the physical environment (on the other). Our understanding of these feedback effects extends across a number of disciplines. Evolutionary psychology seeks to explain psychological traits (such as perception, memory and language) as the functional products of natural selection, acting on genetically inherited variation (for example, Buss, 1995 Confer et al., 2010; Pinker, 1997 Tooby & Cosmides, 2005). These adaptations have evolved to address recurrent problems in human environments. Many of these traits are social, enabling us to cooperate in small and large groups. Cultural evolutionary theory studies how human cultural traits – including ideas, practices and technologies – have evolved through a process of variation, selection and transmission (for example, Mesoudi et al., 2006; Richerson & Boyd, 2005). This theory covers both internal and external measures. Further approaches relevant for in-the-head adaptations enabling people to cooperate in social groups include theories of intentionality, concept acquisition and constructed emotions.[33]

[32] See https://catholicnetwork.us/2019/02/17/points-of-agreement-among-worlds-religions-and-guiding-our-spiritual-traditions-through-higher-levels-of-ethical-and-moral-behavior/

[33] See the shared intentionality theory of Tomasello (2014), the representational redescription theory of Karmiloff-Smith (1995) and the constructed emotion theory of Barrett (2017).

To understand the scope for promoting internal mechanisms for interpersonal cooperation – and thereby develop in-the-head Core Design Principles that are complementary to Ostrom's out-of-the-head ones – it is useful to consider the role of "cognitive gadgets" (mechanisms of thought that are transmitted through social learning)[34] and "cognitive artefacts (the mental products of cognitive gadgets). Whereas genetic evolution has provided humans with general-purpose mechanisms such as memory and the ability to learn, cognitive gadgets – including mechanisms such as imitation, mindreading, normative thinking, metacognitive social learning strategies, and causal understanding – emerge from the interaction between social learning and cultural evolution. Thus, our cultural development is able to transform our cognitive development. By implication, if we manage to create cultures of cooperation to tackle particular, recurrent collective action problems, we can thereby change the way we think, creating a virtuous feedback loop between culture and cognition (in terms of thoughts and feelings). The cognitive gadgets may be understood as the sources of cognitive artefacts, which include capacities such as elements from the Christakis' "social suite" (Christakis, 2019): the capacity to have and to recognize individual identity, love for partners and offspring, friendship, in-group bias, and mild hierarchy (according more prestige to some group members than to others). They also include a variety of prosocial norms and various forms of self-domestication (see Henrich, 2015), as well as an array of mindfulness and compassion training programs (for example, Gilbert, 2013; Williams et al., 2007). These cultural artefacts can generate further feedback loops between culture and cognition.

Thus far, orthodox microeconomic theory has taken little notice of the internal mechanisms above or their interactions with culture.[35] A promising avenue for taking account

[34] See the cognitive gadgets theory of Hayes (2018).

[35] There have been significant forays by economists into the domain of motivation – such as the theory of reason-based rational choice by Dietrich and List (2013), social reputation theory of Benabou and Tirole (2006) and the theory of motivated decision making by Bosworth, Singer and Snower (2016) – but these are just first steps toward a thoroughgoing treatment of the internal mechanisms above.

of how internal mechanisms affect individual economic decisions is through their influence on motives. A motive, as used in motivation psychology, is a force that gives direction and energy to one's behavior, thereby determining the objective, intensity and persistence of the behavior (Elliot & Covington, 2001, following Atkinson, 1964). The psychology literature has identified various motives that clearly affect economic behavior, such as the care,[36] achievement (Atkinson & Feather, 1966; Pang, 2010), affiliation (McClelland 1967; H. Heckhausen, 1989; Heckhausen & Heckhausen, 2010), power (H. Heckhausen, 1989; J. Heckhausen, 2000; Heckhausen & Heckhausen, 2010), and wanting.[37] Lately several contributions seek to incorporate such motives into economic models of decision making (Bartke, Bosworth, Chierchia & Snower, 2019; Bosworth, Singer & Snower, 2016; Chierchia, Parianen-Lesemann, Snower, Vogel & Singer, 2017; Snower & Bosworth, 2016).

Implications for economics

The external and internal mechanisms described above have far-reaching implications for meso- and macroeconomics that remain largely unexplored. Needless to say, people form many communities other than households, firms, and governments, and these other communities – insofar as they make or influence decisions concerning the allocation of resources and the production of goods and services – shape economic activities.

Though households are commonly treated as cohesive decision-making units (superorganisms) or as bargaining partners (for example, Chiappori & Lewbel, 2015) in microeconomic theory, in practice households are neither of these. They are neither bee-hive-like (with members routinely sacrificing themselves for their family) nor composed exclusively of negotiating egotists. Rather, their effectiveness in achieving collective goals

[36] This motive is concerned with nurturance, compassion, and care-giving, e.g. Weinberger et al., (2010).
[37] This motivation system – the closest, though imperfect, match for the standard economic assumption of self-interest – does not receive much attention in the motivation psychology literature. See for example McDougall's (1932) propensity for foraging and ownership and Reiss' (2004) desire for eating, and Gilbert's (2013) seeking drive, an acquisition focused system.

depends significantly on their ability to implement the CDPs 1-6, with due regard to the various needs and abilities of the group members. Within a family, children have different needs and abilities than their parents, but the family unit nevertheless needs a sense of shared identity and purpose, equitable distribution of costs and benefits, fair and inclusive decision making, monitoring behaviors, graduated responses and fast, fair conflict resolution. Failure to observe these principles is responsible for endless family conflicts and estrangement among family members.

In the same vein, firms can be viewed not merely as a set of contractual relations, but also as a community of interest and purpose, containing members with different needs and abilities. With regard to these needs and abilities, as well as the physical, technological and social environments in which the firms are embedded, the firms' effectiveness in achieving their collective goals again depends significantly on their implementation of the CDPs. Though orthodox economics treats firms either as perfectly cohesive decision-making units (superorganisms) or as arenas in which principal-agent problems are solved, the analysis of imperfectly cohesive firms – in which their effectiveness depends on the degree to which they foster inclusive identities, with equitably distributed rights and obligations, distributed decision making, graduated responses to monitored behaviors in participative processes and prompt and fair conflict resolution – is still in its infancy. Along analogous lines, global supply chains can also be viewed as communities of interest and purpose, with varying degrees of cohesiveness.

Naturally, the same also holds for governments and other policy-making institutions, at local, regional, national and supra-national levels. Political economy as a sub-discipline of economics still has far to go in exploring the implications of the CDPs for the direction and implementation of economic policies, as well as the relation between market failures and government failures.

Beyond households, firms, and governments, people form a wide variety of other groups that are engaged in the allocation of resources and the production of goods and services. These include religious, environmental, sports, cultural and countless other groups. The importance of households, firms, and governments – rather than these other groups – as shapers of economic activities should be an empirical matter, not a methodological predilection. In practice, each individual belongs to multiple groups, performing different social roles in different groups. Though these roles – as consumer, employee, congregant, activist, etc. – are often quite distinct from one another, the psychological need for personal integration (see, for example, Reid & Deaux, 1996) (self-representation that includes both personal and social identities) often requires some coordination among these roles. The degree of coordination depends, among other things, on social norms, values and information flows. The growing number of environmentally and socially conscious consumers – who, for instance, are willing to pay more than the prevailing prices for fairtrade products – are an example of such coordination. These issues have received no attention in orthodox economics thus far.

Ignorance as uncertainty

By “ignorance” we mean any absence of knowledge. Economists often call this “imperfect information” or “incomplete information.” We choose the term “ignorance” in order to encompass an absence of knowledge that extends well beyond propositional knowledge and risk (imperfect information about the realizations of known probability distributions). We are also concerned with intuitive knowledge (understanding without conscious reasoning), affective knowledge (the ability to feel emotions of self and others) and psychomotor knowledge (see, for example, Anderson & Krathwohl, 2001).

In the multilevel paradigm, history does not repeat itself in any probabilistic sense, i.e., economic events are not repeated draws from a known, unchanging probability distribution,

with any changes in this time freeze being classified as “structural breaks” or “permanent shocks,” exogenous to the economy. Instead, the evolution of human affairs is a non-stationary process, understood in terms of variation, selection and replication. Our internal and external environment is continually changing. Internally, we continually relate our current experiences to our memories of past experiences and, in the process, continually generate new insights. Externally, the forces of natural selection and artificial selection (such as niche construction and construction of social networks) generate an ever-novel, ongoing dynamic process that produces ever-novel problems demanding ever-novel solutions. Our lives may be understood as an ongoing quest for such solutions.

In this quest, we are conscious of pursuing objectives subject to physical, psychological and social constraints. The objectives are driven by our needs and values; they may not be precisely specified and may not call for optimization. The resulting behaviors, in interaction with the behaviors of others, generate experiences that may change our objectives. We are most likely to thrive when we change our objectives in ways that promote our survival and propagation (in the sense of inclusive fitness). The pursuit of our objectives is commonly identified as the exercise of agency (or “free will”). Since our environment is characterized by stochasticity (containing features that are not predictable in a probabilistic sense), much of this agency is expended in finding creative solutions to new problems.

Of course, there are also many aspects of our environments that are predictable and this is the domain where we construct empirical regularities that guide the mental models whereby we navigate our world. When making our decisions, we must continually try to assess the degree to which our experiences are the outcomes of the identified empirical regularities and predictions of the associated mental models and to what degree they arise from the stochasticity of our environment. These assessments inherently involve guesswork. On this account, we often seek to envisage the outcomes of alternative decisions before

deciding on a course of action. The resulting experiences lead to new problems demanding new solutions.

Our exercise of agency involves seeking solutions to ongoing challenges and choosing a course of action in the light of envisaged outcomes. In this exercise of agency, we are driven by our bodily and psychic needs and constrained by our physical and social environment. This process draws not just on our cognitive knowledge, but also our intuitive, affective and psychomotor knowledge. The cognitive process whereby we ascribe agency to our actions involves providing reasons for our actions. Actions performed in accord with these reasons are deemed rational.

This exercise of agency can occur at various levels of functional organization. Like individuals, social groups face ongoing collective-action challenges calling for collective responses. Participation in the collective involves participating in the social process of finding solutions to these challenges and choosing a course of action from these solutions. The resulting collective decisions constrain the individuals belonging to the collective.

A theoretical framework for understanding this epistemological framework has been articulated by Denis and Raymond Nobel and George Ellis (see, for example, Ellis, 2016; Ellis & Noble, 2021; Noble, 2012; Noble & Noble, 2020). They represent organisms as nested within higher levels of functional organization, just as organs are nested within organisms, tissues within organs, cells within tissues, and so on, down to the subatomic particles. Within these nested systems, higher levels constrain the dynamics of lower levels (downward causation), while each level "harnesses stochasticity" in terms of influencing its dynamics through the conscious or unconscious choice among alternatives. At the level of the individual, this involves the application of perception, attention, memory and values to the choice among feasible courses of action. At the level of the immune system, it involves sensing an antigen invasion, triggering hyper-mutation in a fraction of the genome, sensing

the correctness or incorrectness of the outcome, and reproducing an effective antibody to the antigen.

This approach permits an appreciation of the two capacities that have arguably been most important in the evolutionary success of the human species: the capacity for social cooperation (permitting cooperative social interactions among people as well as the accumulation of cultural knowledge through time) and the capacity for innovation (resting on human creativity in finding new solutions to new problems, particularly through sharing one's knowledge with others). Both of these capacities receive little attention in the orthodox paradigm, which views cooperation primarily in terms of synergies associated with voluntary exchange and innovation primarily as either exogenous (in traditional growth models) or as the output from factor inputs (in the endogenous growth models).

Types of uncertainty

It is useful to distinguish among four types of uncertainty:

(i) "chance uncertainty:" we do not know the probabilities attached to the set of feasible possibilities,

(ii) "domain uncertainty:" we do not know the domain of all feasible possibilities, and

(iii) "ontological uncertainty:" we do not know whether our conceptual tools are appropriate for studying the phenomena under investigation.

An example of chance uncertainty is the outcome of an election, after the candidates are known. The outcome of a U.S. election, just after the Democratic and Republican parties have chosen their candidates, is uncertain. We know the domain of possible outcomes, but we can't attach a probability to these outcomes, because an election of this sort has not been run repeatedly in the past.

A dramatic example of domain uncertainty is the advent of the internet, which was impossible to predict in the 1950s on the basis of everything that was known about technologies then. Early in 1914, it was impossible to predict the outbreak of World War I. Nor was it then possible to predict the rise of Hitler. These were all one-time events, the like of which had never occurred before. They were inconceivable occurrences; people at the time were not aware of the full domain of possible outcomes. All technological innovations, responsible for the lion's share of economic growth, are by their nature domain-uncertain. Had we known of these innovations in advance, the innovations would have occurred before.

Ontological uncertainty occurs when new experiences don't fit into our existing mental models. The degree of ontological uncertainty is always relative to our current experience. Whereas chance and domain uncertainties can be classified as "puzzles," – things to be figured out within our existing paradigms of thought – ontological uncertainties are "mysteries," since we are unable to resolve them with the existing paradigms. New paradigms are called for.

The new paradigm recognizes the existence of chance, domain and ontological uncertainties. This has important implications for our understanding of decision making. The concept of efficiency has limited applicability, since the presence of uncertainty makes it impossible to assess whether an objective can be reached without waste. Waste can be eliminated only when the objective and the best means of achieving this objective have been identified. Instead, adaptability (the capacity to adjust to new situations), resilience (the capacity to recover readily from an array of shocks), and robustness (the ability to maintain operations and accommodate a variety of uncertain future events) become intrinsically important properties of economic decisions as well as economic policies. These properties have received far less attention in economic analysis thus far than efficiency has done.

Acknowledging uncertainty also means recognizing that economic models are always simplified abstractions of the real world. Such abstractions are useful only so long as they

enable us to navigate our environment successfully, avoiding dangers and approaching opportunities, but since the environment is uncertain we cannot tell for sure when our models cease to be useful. Models – from closed-form analytical equation systems to complex numerical agent-based models – as well as the theories that underlie them, always pertain only to the "small worlds" for which they were conceived. This concept of a "small world" was introduced by Leonard Savage (1954, p. 15), who noted that it would be "preposterous" and utterly "ridiculous" to apply his theory of Bayesian decision making to anything outside a "small world."

Since economic behaviors are the outcome of decisions formulated in human brains, which are continually restructuring themselves in response to lived experiences and continually responding to an ever-changing physical and social environment, we cannot assume that there are timeless "laws of nature" governing human interactions, analogous to laws of physics and chemistry. Under these uncertain conditions, we are not justified in applying a theory that works well in one sort of environment (e.g. stable times when such uncertainties are relatively small) to other environments (e.g. unstable times, such as in the aftermath of a novel pandemic). Forecasts based on standard statistical techniques are valid only in the presence of pure risk. In the "large world," confidence that we face only risk is usually misplaced.

Recognizing the prevalence of chance, domain and ontological uncertainties helps explain why it is inevitable that we rely on mental models (schemata) to process information and interpret our physical and social environment. These mental models are conceived to enable easy cognitive access for decision making, respecting the constraints of our working memory and perceptional faculties. They are a restricted class of models pertaining to the "small worlds" whereby we make sense of the world around us. There is a reflexive relation between our mental models and our social environment: The mental models not only shape

how we interpret our social environment, they also affect our behavior patterns and thereby shape our social environment (as analyzed in Hoff and Stiglitz, 2016).

It is impossible to escape from the small-world models that underlie our economic decisions. The small-world models are not the result of mental laziness, a fast-thinking short-cut to proper slow-thinking deliberations. In the presence of uncertainty, small-world models are all that we have access to. Consequently, it is inconceivable that our perceptions, beliefs and objectives could ever be free of social influences – just as it is inconceivable that the social forces for norms, values, identities and narratives could ever be free of our perceptions, beliefs and objectives. Our economic decisions – along with our underlying understanding of the world – are inevitably embedded within our societies, both in terms of persistent identities and cultures and of our ever-varying social relationships.

To address the uncertainties of the "large world" in which we live, it is wise to entertain theory-pluralism, which is meant to engender "cogni-diversity," namely, the recognition that multiple, mutually incompatible mental schemata may be relevant guides for our decisions in an unpredictably changing world. Such cogni-diversity plays an analogous role to that of biodiversity in ecological ecosystems. The greater the diversity of mutually incompatible theories, all supported by evidence from a variety of data sets, the more open-minded we are likely to become and the more likely we are to extend our creative imagination beyond its current confines. Thereby we become more likely to adapt our thought processes to new situations.

In the analysis of most economic problems – particularly macroeconomic ones – this theory-pluralism will embrace both small-scale analytical models (with closed-form solutions) and large-scale, numerical, complex models. On the one hand, the complexity economics models (applying complexity science to economics) are able to trace the adaptive behavior of heterogeneous agents in the economy in ways that are beyond the reach of analytical

models.[38] On the other hand, the analytical models provide a transparency and flexibility that make it easier to investigate the effects of modifications and alternative conceptualizations of large-world situations. Thereby they may help us identify important causal chains and parameters in the diagnosis of economic problems.[39] It is important to keep in mind that both the analytical and the complex models are both small-world attempts to understand the large world. Both have their uses and misuses.

In the presence of uncertainty, the fundamental economic concept of "equilibrium" – a state in which there is no tendency for changed behavior – becomes irrelevant as a description of the "large world." Even if we fully understood the full physical environment in which we live – which is inherently unknowable – we could still not be confident that people have no tendency to change their behavior, since people are continually learning and innovating and continually interacting with one another in new ways.

At best, the concept of equilibrium is useful only with regard to a small world in which the environment is understood (such as in roulette and other man-made games). Then we can ask whether human behavior would settle down to some stationary pattern if this environment were to remain unchanged. If the answer is affirmative, then the "equilibrium" is the answer to this hypothetical question. The applicability of this concept to economic activities is bound to be quite limited.

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[38] For example, the nonlinear dynamic behavior patterns of these agents do not aggregate straightforwardly into nonlinear dynamics of analytical models. Furthermore, complex systems can trace dispersed interactions among agents, mediated by legal institutions and social norms, with cross-cutting hierarchical organizations and ongoing adaptation. See, for example, Arthur, Durlauf and Lane (1997), Arthur, Beinhocker and Stanger (2020) and Beinhocker (2006).

[39] The early efforts to model the spread of HIV are a good example. The complex model produced by the World Health Organization in the 1980s did not predict the severity of the epidemic as well as the simpler analytical model of May and Anderson (1987), since the latter was able to identify the number of sexual partners as a crucial factor determining the spread of the disease, whereas the WHO model was too complex, in terms of country-specific demographic data, to permit ready identification of this factor. The superiority of complex models over analytical models cannot be assumed without empirical investigation. (See, for example, Green and Armstrong (2015) for cautionary results.)

The role of theory

A thorough appreciation of our ignorance in terms of uncertainty – rather than merely risk – calls for a new understanding of the role of theory in economics. Needless to say, neither of the authors of this article is hostile to formal theorizing. Snower is fully at home with it in economics and Wilson is fully at home with it in evolutionary science. But both authors believe that the current role of theory in economics is more like a straightjacket than an enabler of productive inquiry. In what follows, we seek to clarify the sense in which orthodox economic theory is a straightjacket and the sense in which the multilevel approach suggests a new role for economic theory.

As with so much of orthodox economics, its conception of theory is rooted in 19th century physics, where a non-living system such as the orbits of the planets could be modelled with mathematical precision. Emulating this conception of theory for a "physics of social behavior" required the simplifying assumptions associated with *Homo economicus* and markets at equilibrium (Beinhocker, 2006). Relaxing the assumptions is difficult or impossible because it makes the math difficult or impossible. This is the sense in which formal mathematical models become a straightjacket rather than an enabler of productive inquiry.

Darwin's theory of natural selection never attempted to emulate physics and didn't need to. Its assumptions (individuals vary, resulting in differences in survival and reproduction, which are transmitted to offspring) were so simple and self-evident, at least in retrospect, that they could be described in words. The major predictions emanating from the theory, concerning such things as identity by descent, biogeography, and adaptations of organisms to their environments, made sense of existing information and organized the search for new information without requiring mathematical models.

Formal mathematical models of evolution began to be developed with the advent of Mendelian genetics. Genes that code for single traits that differ in their survival and

reproduction are sufficiently mechanical that their change in frequency can be modelled with mathematical precision – but only for the simplest cases. Complex cases such as multiple loci, gene-gene interactions, frequency dependence, and fluctuating environments quickly prohibit anything that could be called a mathematically derived fundamental theorem of evolution[40].

Instead, formal models play a different role in evolutionary theory. They are constructed around specific topic areas, such as the many different multi-group population structures that we listed earlier in this section. Each model makes assumptions that are tailored to the particular real-world context, such as ephemeral groups vs. permanent groups with dispersal between adjacent groups. Each formal model results in predictions that were not obvious from verbal modeling, which is the power of formal modeling. However, each formal model also must be compared to the real-world context to make sure that its assumptions capture the essence of what is being modeled. Otherwise, the formal model runs the risk of becoming detached from reality. And many formal models are required because there are so many contexts. This is what it means for formal models to become enablers of productive inquiry rather than straightjackets.

What we have described for evolutionary theory affirms what Leonard Savage wrote about "small worlds" and is needed for the study of any complex system, including purely physical systems such as the weather. In his 1987 book *Chaos: Making a New Science*, James Gleick describes how over-reliance on formal mathematical models prevented physicists from understanding even something as simple as the dynamics of a dripping water faucet. Computer simulation models were looked down upon because they merely examined special cases and didn't offer general proofs. A change in mindset about theory was required for the science of complexity to emerge. In a complex world, there is no alternative to the

[40] Ronald Fisher (1930) attempted to formulate a fundamental theorem of natural selection, defined as the rate of increase in fitness of any organism at any time is equal to its genetic variance in fitness at that time. Like economic theorems, however, this one applies only under highly simplified circumstances and does very little useful work in evolutionary theory. See Edwards (1994) for a discussion.

construction of models tailored to specific contexts and testing them against reality at frequent intervals.

To see how the change in mindset applies to economic systems, consider three great crises of the twenty-first century – the 9/11 attack (in the political domain), the financial crash of 2008 (in the economic domain) and the Covid-19 pandemic (in the natural domain). None of these events was probabilistically predictable, for the simple reason that we had not encountered such events before. Naturally, world history is replete with terrorist attacks, financial crashes and pandemics; but what made these events unprecedented was the contexts in which they occurred. The 9/11 attack appeared as a backlash against American hegemony, liberalism, democracy and capitalism after the fall of the Iron Curtain. The financial crash of 2008 emerged out of the proliferation of financial derivatives and subprime mortgage lending practices, along with deregulation and the regulatory capture of financial rating agencies. The Covid-19 pandemic came out of the relentless disappropriation of wild animals of their habitats by human beings. These contexts – each playing a crucial role in shaping the effects of the crises on human wellbeing – were all unprecedented in human history.

These events were radically uncertain, in the sense that we did not know the probability distributions from which they were drawn. The reason is simple: They were not, in fact, drawn from probability distributions. Probabilities can be derived only when we are confronted by replicable experiments, such as the roll of a dice. In principle, this experiment can be repeated countless times with a fair dice, enabling us to calculate that the probability of rolling a “2” is 1/6.

The three crises above are not replicable in this way, for many reasons, not least because we learn from our experiences and this new learning creates a new context in which events take place. Thus repetitions of 9/11, the financial crash and the pandemic would lead to quite different outcomes. These political, economic, and natural events are truly as unpredictable as the weather.

It should be obvious that an orthodox economic theory which attributes all unknowns to “risk” (unknown events whose probability distributions are known), to which statistical techniques are applied, is hopelessly maladapted to responding to the problems of our age. Instead, we must formulate systemic goals and work toward them with models tailored to the situation, which are tested against reality at frequent intervals. In other words, we must consciously manage the process of cultural evolution as agents of system-level selection. In the final section of this article, we will provide examples of managed cultural evolution in real-world settings.

Multilevel sources of wellbeing and progress

Human wellbeing is an important driver of cultural selection and transmission. The quest for wellbeing – defined broadly to include all aspects of human thriving – underlies many of the behavior patterns, practices, ideas, norms and values that people select from the options available and transmit to others. In what follows, we will argue that wellbeing is multifaceted and context-dependent.

Progress – the advancement of individual and collective wellbeing – arises in the process of cultural selection in response to variation. We will argue that achieving higher levels of functional organization is a vital driver of progress.

Let us now consider the sources of wellbeing and progress in turn.

Multifaceted, context-dependent wellbeing

In the multilevel paradigm, wellbeing is intrinsically multifaceted, comprising both individual and collective sources. Which sources of wellbeing are salient depends on our social and physical contexts. These contexts are the outcomes of our individualistic and collective intentions and behaviors. In this sense, our wellbeing is the outcome of a reflexive interaction between individual decisions and social forces.

The wellbeing of agency differs from that of sociality. The wellbeing of individualistic agency (shaping my fate through my own efforts) differs from that of collective agency (contributing to shaping the fate of my social groups). The wellbeing of care and affiliation (distinct forms of prosociality) differ from that of status-seeking and power (distinct forms of self-interested sociality). Our different ways of interconnecting with others in and across social groups generate different kinds of wellbeing.

These individual and collective sources of wellbeing have two important characteristics: (1) They are context-dependent. For example, the salience of our relative need for personal agency and social solidarity depends on our social and physical contexts. (2) They are not substitutable for one another, at least beyond particular threshold levels and time periods. For example, it may be impossible to compensate you for solitary confinement by offering you more consumption opportunities. It may be desirable to sacrifice one's individual wellbeing for social purposes in the short run, but not in the long run.

On account of these two characteristics, it is not useful or even possible – for the purposes of decision-making – to combine all sources of wellbeing in a single, time-invariant unit of measurement. This does not imply that people are unable to make tradeoffs between these components – on the contrary, they routinely do so – but the tradeoffs are limited and not identifiable independently of the social and physical context.[41]

In short, wellbeing is not a homogeneous entity that can be measured by a single metric, such as the utility functions of neoclassical and behavioral economists or the indexes of happiness and life satisfaction. Rather, a dashboard of wellbeing indicators is called for. This dashboard is to be viewed as analogous to the dashboard of an airplane: The dials for direction, speed, altitude and fuel are not to be aggregated into one number, from which the health of the plane can be inferred. Rather, the various elements of the dashboard must stand

[41] Adler and Fleurbaey (2016, Part 3) provides an insightful overview of different approaches to the evaluation of wellbeing and the tradeoffs among the components of wellbeing.

in particular relationships to one another. If the plane is losing height, the pilot cannot compensate by increasing the speed. If the plane is short of fuel, the pilot may have to change direction (aiming for the nearest landing strip). The relative significance of the dashboard components depends on the context.

Similarly, people require material sustenance, empowerment and social belonging within a stable environment,[42] with the appropriate mix depending on the context. People's needs and purposes include those underlying the two capabilities that have made *Homo sapiens* so successful in the evolutionary process: sociality and innovation. Sociality (encompassing affiliation and care) is responsible for cooperation beyond enlightened self-interest. Innovation, or adaptability in evolutionary terms, is driven by the need for agency (the ability to shape one's prospects through one's own efforts), together with elaborate social feedback effects, often driven by sociality. These constituents of wellbeing are not closely related to the consumption of goods and services. Though we can and do trade off these multiple dimensions of wellbeing against one another, these tradeoffs tend to be highly context-dependent, so that we do not have some time-invariant measuring rod for overall wellbeing.

Both the individualistic and collective needs of an individual must be satisfied in order to live a thriving life. Within any particular social group, individuals differ in terms of the relative importance of their individualistic and collective needs for their wellbeing. Cultures differ dramatically in terms of the weight they give to the individualistic and social determinants of wellbeing.[43]

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[42] These elements of wellbeing are measured explicitly in the SAGE dashboard of Lima de Miranda and Snower (2020), where S represents "Solidarity," A represents "Agency," G stands for "material Gain," and E signifies "Environmental sustainability."

[43] Henrich (2020) distinguishes between "regulated-relational worlds" (where the social determinants of wellbeing are predominant) and "individualistic worlds" (where the individualistic determinants predominate). Koreans and Japanese belong to the former; Americans, Australians and British belong to the latter. For empirical evidence, see Hofstede (2003).

These needs must stand in context-specific relationships to one another. Wellbeing is ubiquitously context-dependent. It mirrors the successes and failures of people in their competitive and cooperative efforts within and between social groups. This context-dependent wellbeing is an important driver of the evolution of people's preferences within their social groups (see, for example, Bosworth & Snower, 2016; Bosworth, Singer & Snower, 2016).

The laughter and friskiness of your child may induce you to play; the child's cries of pain elicit your care and compassion; the child's screams of fear in the presence of a growling dog prompt protective goals; and so on. We are pained by the pain of our loved ones, but we may feel Schadenfreude at the pain of our adversaries (Singer, Seymour, O'Doherty et al., 2006). In short, wellbeing is both multidimensional and contextual. The various endeavors to measure wellbeing in economics have not confronted this context-dependence.

On this account, the single-minded accumulation of material wealth may be a mixed blessing for everyone except the poor. For once people are materially secure, the quest for material things may come at the expense of other sources of wellbeing. The more we value material things and the more aspects of our lives we allow to be governed by market forces, the less we are able to partake of the non-material sources of wellbeing – and particularly those associated with compassion and care. We are psychologically incapable of being competitive and caring at the same time. Market transactions may crowd out non-market norms, such as duty, responsibility and faithfulness.

These considerations affect the conduct of many aspects of our lives. If we give our children cash as reward for good school performance, we may teach them more about accumulating cash than accumulating knowledge. If a country sells immigration quotas to foreigners, it may instill more avarice than virtues of citizenship in them. When military service is delegated to private contractors, it spreads the drive for profit maximization rather than patriotism.

Economic progress may become decoupled from encompassing social progress, for the simple reason that economic growth (and the associated rise in consumption opportunities) need not be closely related to the growth of social solidarity or personal agency.[44] It has been argued that the forces of globalization, digital technological advance and financialization over the past four decades have weakened the connections between economies and societies. In particular, shifting global supply chains, automation and the pressure to generate short-term financial returns have weakened communities and disempowered workers with routine skills (see Kelly & Sheppard, 2017; Kelly & Snower, 2021). This decoupling of economic from social progress can be identified as a source of populist discontent and social discord (Bosworth & Snower, 2021). Recoupling economic and social progress calls for new approaches to government policy, business strategy and leadership.

With regard to government policy, for example, active and passive labor market policies generally have quite different effects on empowerment, even after differences in material living standards, economic security, and the work-leisure balance have been taken into account. Giving long-term unemployed workers incentives to become skilled and employed through hiring subsidies has a different influence on personal agency and social embeddedness than do wage subsidies (see, for example, Snower, 1993, 1994). Regarding business strategy, recoupling economic and social progress calls for a shift from the pursuit of shareholder value to the pursuit of stakeholder value. When the latter is combined with socially inclusive legal obligations, targets and incentives from the government – an example of purposeful cultural evolution – business activity can deliver more social progress (Kelly & Snower, 2021). Cooperation and competition in the workplace have quite different effects on social solidarity (for example, Lindbeck & Snower, 1988). The recoupling agenda also calls

[44] Lima de Miranda and Snower (2020) provide empirical evidence for a variety of countries.

for participatory, empowering, inclusive approaches to leadership, in line with Ostrom's Core Design Principles (for example, Atkins, Wilson & Hayes, 2019; Sheppard, 2020).

In the economic world of goods and services, it is unwise to follow single-mindedly a "the more the merrier" strategy with respect to our wellbeing. There are tradeoffs to be recognized and choices to be made. The more we focus on the satisfaction of our material resource desires, the less opportunity we may have to fulfill our needs for connecting and giving. The more concerned we are to protect ourselves from external threats, the less latitude we have to open ourselves to others in trust and mutual reliance. It is important to look beyond capital and wealth in assessing the success of economies (see, for example, Snower, 2018).

Multilevel evolution as a driver of progress

In the multilevel paradigm, "progress" is specified in terms of multi-faceted wellbeing, rather than in terms of the accretion of consumption goods and leisure. As noted, this wider concept of wellbeing includes the exercise of agency and the sense of solidarity within one's communities. We have a deep-seated drive to belong to social groups (see, for example, Walton et al., 2012) and we derive our social identities from our group memberships. Solitary confinement is painful and psychologically destabilizing. We naturally cooperate with other group members, deeming them to be trustworthy and well-meaning. We also have a deep-seated drive for the exercise of agency and empowerment. Since the Enlightenment, this has grown into a widespread desire to exercise creativity and innovation[45] as a process of self-realization (see, for example, Phelps, 2013).

The multilevel theory guides our attention to the internal and external mechanisms to promote creativity and intrinsically-driven cooperation. The latter, based on care for and

[45] We may distinguish creativity from innovation by considering the former to be the act of conceiving something new and the latter to be the act of putting something new into practice.

affiliation with others, extends beyond enlightened self-interest. Both the creativity and the intrinsically driven cooperation can be motivated and trained (in-the-head processes) and promoted through institutional design (out-of-the-head processes). Furthermore, institutional design can channel enlightened self-interest into directions that serve higher-level social interests.

As noted, progress may be understood in terms of variation, selection and transmission. Creativity and innovation in the economic realm are aspects of variation. The processes of multilevel selection (economic and cultural) promote those new products and processes that are particularly effective at addressing challenges and opportunities that we face. The process of transmission involves imitation of the selected products and processes. Promoting progress is about encouraging sufficient variation in terms of ideas, ensuring that selection is in the public interest (rather than merely in the interest of the most powerful), and encouraging the transmission of wellbeing-enhancing innovations.

Each of these aspects calls for cooperation at the appropriate levels of functional organization. First, creativity and innovation are promoted through cultures of "dynamism" that value originality and discovery (see Phelps, 2013). Second, the selection of beneficial ideas, products and processes requires forward-looking cultures that welcome new ideas, submit them to rigorous empirical investigation, protect them from special interests of incumbents and bureaucratic red tape, and promote the adoption of excellence. And finally, the transmission of ideas and innovations also benefits straightforwardly from individuals' internal and external participation in higher levels of functional organization.

In this context, it is important to keep in mind that complex systems of agents pursuing their respective adaptive strategies (CAS2) do not robustly self-organize into complex systems that are adaptive as systems (CAS1). The evolution of CAS1 systems requires a process of selection at the level of the whole system, which must be strong enough to prevail against disruptive selection operating at lower levels.

Coda: Rethinking the Invisible Hand

The multilevel paradigm has far-reaching implications for our understanding of economic events, prediction and policy recommendation. These implications will be addressed in a companion article, "Putting the Multilevel Paradigm to Work." For now, we restrict ourselves to a reassessment of Adam Smith's Invisible Hand.

The multilevel paradigm sheds new light on the most far-reaching and influential insight of orthodox economics, namely, that the uncoordinated decisions of countless selfish decision-makers can produce collectively desirable economic outcomes. In this context, people transacting in "perfect markets" can satisfy consumer's demands as efficiently as possible. This means that once the transactions have taken place everywhere in the economy, it is impossible to make one individual better off without making another individual worse off – a concept known as Pareto efficiency.

The orthodox interpretation of the invisible hand

The notion of people transacting in "perfect markets" – economic markets that are not encumbered by "frictions" and "imperfections" – is meant to be analogous to the notion of a perfectly round ball rolling down a perfectly straight incline in a perfect vacuum (so that its speed is exactly in accordance with Newton's laws of motion). Perfect markets are ones in which there are no externalities (uncompensated costs and benefits), no exercise of market power, no asymmetric information and no transactions costs. In an economy composed of such markets – and characterized by uniqueness and stability conditions[46] – it can be shown that the general equilibrium (the quantities and prices transacted in clearing markets) is Pareto efficient. This result – known as the First Fundamental Theorem of Welfare Economics – occupies such a central place in economic analysis since it appears to explain why goods and

[46] Uniqueness conditions ensure that there is only one set of prices at which the demands for all goods and services are equal to the their corresponding supplies. Stability conditions ensure that if these demands are initially not equal to their corresponding supplies, then voluntary exchange will bring about a change in prices, so that equality is speedily achieved

services requiring many different inputs from many different countries and many different firms – such a piece of paper, a computer, an internet connection, or the water supply in a residential dwelling – get produced reliably and remain responsive to changing consumer demands without any central coordination. This is magic of Adam Smith's Invisible Hand, described in *The Wealth of Nations* in what is probably the most famous citation in economics:

> "… every individual … neither intends to promote the public interest, nor knows how much he is promoting it. (…) he intends only his own gain, and he is in this, as in many other cases, led by an **invisible hand** to promote an end which was no part of his intention. Nor is it always the worse for the society that it was not part of it. By pursuing his own interest he frequently promotes that of the society more effectually than when he really intends to promote it. I have never known much good done by those who affected to trade for the public good. It is an affectation, indeed, not very common among merchants, and very few words need be employed in dissuading them from it." (Smith, 1776, Book IV, Chapter II, paragraph IX)

The underlying phenomenon is pervasive and counterintuitive. The production of a sheet of paper nowadays requires the coordinated efforts of many thousands of people around the globe – from the miners who extract the minerals contained in the machines that refine the pulp and mix it with water and other additives, to the operatives who press and dry the paper, to the wholesalers who cut it into sheets, to the drivers who distribute it to the retailers, and so on. Since paper production is not vertically integrated, there is no central coordination of the many people involved in this process. Instead, these people are simply purchasing and selling the plethora of raw materials, labor services, physical capital services and intermediate inputs that flow into the production of each sheet of paper. That such highly complex chains of

personal interactions, along extensive stages of production, can satisfy consumers' paper demands without central coordination, strikes many as surprising.

Not only is it possible to satisfy consumption demands through uncoordinated voluntary market activities, but this free-market system appears to function much better than central coordination does. The Invisible Hand is commonly invoked to elucidate why capitalist economies (characterized by private property, free enterprise and voluntary exchange in decentralized market activities) have been much more successful in generating material affluence than communist economies (characterized by state ownership and control of the means of production, as well as central planning).

The economists' depiction of Adam Smith's Invisible Hand through the First Fundamental Theorem of Welfare Economics presupposes strict individualism. Each economic agent – each household and each firm – strives only to maximize the payoff accruing directly to him- or herself. The people in this economy are not connected through bonds of empathy, compassion, mutual obligation, or social norms. They are rational, calculating, greedy and lazy, but lack any feelings for one another. Prices are the only mechanism through which their actions are coordinated. The concept of Pareto efficiency also presupposes strict individualism, as each individual's wellbeing is assumed to depend on her own consumption. Thus increasing one individual's consumption without reducing another individual's consumption makes the former better off without making the latter worse off.

Problems with the orthodox interpretation

The standard portrayal of economic agents in neoclassical and behavioral economics is compatible with the American Psychological Association's definition of psychopathy, as a synonym of anti-social personality disorder, which is "a pattern of disregarding or violating the rights of others. A person with antisocial personality disorder may not conform to social

norms, may repeatedly lie or deceive others, or may act impulsively."[47] This implies that the First Fundamental Theorem of Welfare Economics identifies the conditions under which a population of psychopaths can satisfy each other's consumption demands efficiently through voluntary exchange. Since people with psychopathic personalities represent no more than 1 percent of the population (Tsopelas & Armenaka, 2012), this is clearly not a useful description of people's actual patterns of thinking, feeling and behaving. The important question, however, is whether the economists' portrayal of economic agents is a suitable simplification for explaining why people in market economies manage to satisfy consumers' demands without central coordination.

There are many reasons to suspect that this is not so. If people were indeed GASLARF (greedy, asocial, selfish, lazy, autonomous, rational and far-sighted), we would need police guarding virtually every shop window and CCTV continually following everyone, for otherwise many people would find it cheaper and more convenient to steal than to buy. Instead, most people are kept from stealing by moral values and social norms that they have internalized, not by the fear of punishment from law-enforcement officers. If you asked a GASLARF stranger for directions, you would receive no answer or a lie that benefits the stranger. A country populated by GASLARFs would require prodigious legal, judicial and penal systems, since contracts would not be honored unless enforced. Countries would be unable to defend themselves, since soldiers would fulfill their duties only if monitored, the monitors would need monitoring, and so on. No one would vote in a national election, since such elections are never decided by a single vote. Parents would not care for their children unless they had a well-founded expectation that these children would repay them later on. Furthermore, people would always exploit all potential gains from trade, regardless of whether they belonged to the same culture or a different one. In practice, however, people

[47] APA Dictionary of Psychology, https://dictionary.apa.org/psychopathy, 2020.

generate far more opportunities for mutually beneficial transactions within their social groups than outside them. When people are mistrustful or hostile to one another (like some Israelis and Palestinians, Shia and Sunni Muslims, Hindus and Muslims, natives and immigrants), few gains from trade are exploited and the market economy withers.

So, if the economists' standard interpretation of the Invisible Hand cannot explain many empirical regularities, then how can we explain the success of market economies in satisfying so many consumer demands?

The multilevel interpretation

Among the Enlightenment philosophers who compared human society to a beehive was Bernard Mandeville (1670-1733) and his Fable of the Bees (Mandeville, 1714; Wilson, 2004). Not only did Mandeville portray human commerce as a teeming beehive, but he portrayed solid citizens as no different than knaves in their contribution to the common good.

> *As Sharpers, Parasites, Pimps and Players,*
> *Pick-pockets, Coiners, Quacks, Sooth-Sayers,*
> *And all those, that, in Enmity*
> *With down-right working, cunningly*
> *Convert to their own Use the Labour*
> *Of their good-natur'd heedless Neighbour:*
> *These were called Knaves; but, bar the Name,*
> *The grave Industrious were the Same.*
> *All Trades and Places new some Cheat,*
> *No Calling was without Deceit.*

Adam Smith was critical of Mandeville and was amply aware that knave-like behavior is often just plain bad for the common good (Wright, 2005), but his metaphor of the Invisible Hand (which he invoked in print only three times) conveys the same idea that economies run as much or even more on self-interest than overtly other-oriented behaviors. The metaphor of

the Invisible Hand is formalized in economic theory by the First Fundamental Welfare Theorem, as discussed above.

The multilevel paradigm suggests that the orthodox conception of the Invisible Hand is profoundly misleading. The entire thrust of multilevel approach is that the only way for CAS2 systems (composed of agents following their respective adaptive strategies) to become CAS1 systems (that function well as systems) is by a process of system-level selection. In orthodox theory, the beneficial workings of the Invisible Hand are specified as the Pareto efficiency of the general equilibrium, in the absence of externalities and other market failures and the presence of clearing markets. Under these conditions, CAS2 systems can indeed become CAS1 systems merely through the exploitation of individual-level synergies through voluntary exchange. Though this is technically correct, the conditions for Pareto efficiency are never fulfilled in practice. Thus, in the real world of widespread market failures and non-clearing markets, it is necessary to explore the processes of system-level selection that could make the Invisible Hand work.

In a way, this might strike some economists as old news. Only the most vulgar rendering of the Invisible Hand metaphor pretends that the unfettered pursuit of self-interest robustly benefits the common good. In some domains of their discipline – such as competition theory – economists know that economic markets need to be structured to avoid disruptive forms of self-interest and by constructing such markets are performing system-level selection in their own way. Many standard economic policy proposals — such as measures to promote competition or tax-subsidy schemes to enable economic agents to “internalize” externalities – may be understood as policies to promote system-level selection.

But the multilevel paradigm offers a much broader toolkit for system-level selection than orthodox theory. Take equity as an example. The multilevel approach treats it as a fundamental aspect of cooperative governance at all scales. Without safeguards for ensuring that the benefits of cooperation are proportionate to one’s contribution, then disruptive lower-

level selection will take over. Equity begins at the "cellular" level of small functionally organized groups (e.g., families, schools, neighborhoods, businesses, etc.) and continues in the participation of these groups in larger scales of governance and multiple spheres of activity. In contrast, orthodox economic theory sees its purpose as the maximization of efficiency in a way – given its assumptions – that trades off negatively with equity. The main tools for increasing equity are taxes and subsidies.

Within the multilevel paradigm, a new conception of the Invisible Hand can be achieved by observing the need to operate in two capacities: 1) as *designers* of social systems; and 2) as *participants* of the systems that we design (Wilson & Gowdy, 2015). As designers, we are agents of selection at the scale of the whole system and must have the welfare of the whole system in mind (Mulgan. 2021). This is the opposite of the Invisible Hand metaphor. As participants, we can indeed follow our lower-level interests (which is not the same as behaving like *Homo economicus*) without having the welfare of the whole system in mind, in keeping with the Invisible Hand metaphor. In short, system-level selection *is* the invisible hand that winnows lower-level behaviors that contribute to the common good from the much larger set of set of lower-level behaviors that would disrupt the common good.

Concluding Thoughts

The constellation of ideas presented here are not new in isolation, but in conjunction with one another – we have argued – they provide the outlines of a new economic paradigm. Whereas the current paradigm (comprising neoclassical economics along with its many variants) views the economy as a machine – with components standing in fixed, well-defined relations with one another – the new paradigm recognizes the economy to be a living system, composed of component living systems comprising human beings and social groups. As noted, the critical feature of living systems is that they are adaptive. Adaptation takes place through selection at multiple levels. This means that the relevant decision-making units in economics are not just

individuals, but also social groups. These decision-making units adapt to an unpredictably changing environment, characterized by variation in the physical, social, political and economic domains. The Darwinian triad of variation, selection and replication – applied primarily to cultural evolution – is appropriate for the analysis of these living systems.

Variation necessitates consideration of decision making in response to uncertainty, which may take the form of chance uncertainty (ignorance of the probabilities attached to the set of feasible possibilities), domain uncertainty (ignorance of the domain of all feasible possibilities) and ontological uncertainty (ignorance of whether our conceptual tools are appropriate for studying the phenomena under investigation). As we have seen, acknowledging uncertainty implies an approach to economic theory that differs radically from that of the neoclassical economic models with rational expectations (where people's information sets are viewed as subsets of the "true model"). In particular, recognition of uncertainty means that the "large world" of economic reality is unknowable and that all economic models can only pertain to "small worlds" (mental schemata that help us navigate our environment). Our small-world models depend heavily on social constructs including norms, values, identities and narratives. These constructs are built on the perceptions, beliefs and objectives generated by an underlying economic paradigm, which determines the data to be observed, the types of questions to be asked, the structure of the associated answers, the interpretation of empirical evidence, and the types of predictions that are made. Dealing with uncertainty calls for theory-pluralism and cogni-diversity, which promote the resilience, robustness and adaptability of our decision-making processes. These aspects of decisions are quite different from the concept of efficiency underlying the decisions in orthodox economics.

Selection and replication are central to the processes of adaptation guiding the evolution of economic activities in the multilevel paradigm. An important aspect of these adaptation processes is the human ability to operate at higher levels of functional organization in response to collective challenges. We believe that this multilevel paradigm provides a far

more fertile soil than the orthodox paradigm does to nourish other influential schools of economic thought – including identity economics (where identities are the social glue enabling people to operate at higher levels of functional organization); the social preferences, norms, and many heuristics and biases of behavioral economics; institutional economics, in dealing with the evolution of economic institutions in shaping economic behavior, evolutionary economics (based explicitly on Darwinian evolution, as recommended by Hodgson 2019b); the social decision-making aspects of neuroeconomics; and the aspects of ecological economics dealing with the interaction between social and natural ecosystems. These issues will be the subject of the third article in this series titled "Orthodox Economics and Its Discontents."

Whereas the orthodox paradigm focuses on individual challenges (such as maximizing utility subject to a budget constraint or maximizing profit subject to a production-function constraint) to be tackled through decisions by individual decision makers and views "externalities" as a phenomenon to be "corrected" through the appropriate government interventions, the multilevel paradigm recognizes the centrality of collective challenges in our lives (such as public goods and commons) to be tackled through a combination of social mechanisms – both internal (inside our heads) and external (outside our heads) – as well as political and institutional mechanisms. The processes of selection and replication affect all aspects of our economic decision making, including our perceptions, beliefs and objectives. Though these processes may enable us to tackle ever larger collective challenges through ever higher levels of functional organization, our progress in this regard is always vulnerable to being undermined by lower-level pressures of selection and replication. It is on this account that economic and social policy needs to address the challenge of shaping cultural evolution in accordance with our needs and purposes, to be addressed in the second article in this series titled "Putting the Multilevel Paradigm to Work."

Acknowledgements

We are deeply indebted to various brilliant thinkers with whom we have had the privilege to interact on an ongoing basis and who consequently had a profound influence on our quest for a new paradigm: Angus Armstrong, George Akerlof, Eric Beinhocker, Ruth Chang, George Ellis, Marc Fleurbaey, Celia Hayes, Geoffrey Hodgson, Ravi Kanbur, Marika Karanassou, Arun Maira and David Tuckett. We are also grateful for the many insightful comments we have received for parts of this paper from Andrew Briggs, Paul Collier, Herb Gintis, John Gowdy, Kurt Johnson, David Korten, Lisi Krall, Colin Mayer, Denis Noble, Rolf Langhammer and Kate Rockett.

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