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Economic Cosmology and the Evolutionary Challenge

by

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Abstract

The intellectual histories of economics and evolutionary biology are closely intertwined because both subjects deal with living, complex, evolving systems. Because the subject matter is similar, contemporary evolutionary thought has much to offer to economics. In recent decades theoretical biology has progressed faster than economics in understanding phenomena like hierarchical processes, cooperative behavior, and selection processes in evolutionary change. This paper discusses three very old “cosmologies” in Western thought, how these play out in economic theory, and how evolutionary biology can help evaluate their validity and policy relevance. These cosmologies, as manifested in economic theory are, (1) rational economic man, (2) the invisible hand of the market, and (3) the existence of a general competitive equilibrium. It is argued below that current breakthroughs in evolutionary biology and neuroscience can help economics go beyond these simple cosmologies.

I. Introduction

Theoretical controversies in biology and economics are remarkably similar: This is so because of the similarity of the subject matter of the two disciplines (evolving complex systems), and because both fields have implicitly adopted core beliefs embodied in “Western Cosmology” (Sahlins 1996)¹ that have preoccupied theologians, philosophers and social theorists for millennia. However, the last thirty years have seen a revolution in thinking about evolution in biology and in relation to our own species (Boehm, 2012; Henrich et al., 2004; Jablonka and Lamb, 2006; Richerson and Boyd, 2005; E.O. Wilson 2012). The purpose of this special issue of JEBO is to show how these developments can offer guidance for rethinking economic theory.

¹ The term “cosmology” is used by Sahlins and other anthropologists to define a level of analysis that lets us at least partially escape the confines of a highly evolved “mother culture.” Applbau (1998, 325) writes: “[T]he term ‘cosmology’ appears a more flexible and inclusive substitute for culture, indicating a totalizing framework in which culture is given historical and manipulable dimensions while retaining both its totalizing quality and its subjective interpretability through ‘key symbols’.”

The role of this article within the special issue is to show how the developments can help to overcome the limitations and biases implicit in the core beliefs of Western Cosmology. These beliefs include the view that (1) “natural man” is a self-sufficient, egotistical individual free from the bonds of human society, (2) despite the self-interest of its members, qua competition among them, society can function well, and (3) there exists an ideal, optimal state of nature.

These three features of the Western cosmology are reflected in canonical economic theory in the form of the self-interested, rational actor assumption, the invisible hand conjecture, and the belief in the existence of a general market equilibrium, respectively. Traces of the same cosmology can be found in biology in how both Charles Darwin and Alfred Russel Wallace, conceived of their theory of evolution by natural selection -- not least because their idea of adaptation through competition got inspiration from reading the economists of their day, such as, Thomas Malthus and Adam Smith.² The corresponding model for natural selection was the dog-eat-dog world of industrial capitalism as it existed in England in the 1800s. Although the term “survival of the fittest” was coined by the sociologist Herbert Spencer, not by Darwin or Wallace, this view of nature was quickly adopted by Darwin’s defenders like Thomas Huxley (1888, page): “From the point of view of the moralist the animal world is about on a level of a gladiator’s show. The creatures are fairly well treated, and set to fight - whereby the strongest,

² In his autobiography Darwin (1958 [1876], 34-35) wrote: “I happened to read for amusement Malthus’ *On Population*, being well-prepared to appreciate the struggle for existence which everywhere goes on from long-continued observation of the habits of animals and plants, it at once struck me that under these circumstances favorable variations would tend to be preserved and unfavorable ones to be destroyed. The result of this would be the formation of new species. Here, then, I had at last got a theory by which to work.” Likewise, Wallace wrote in 1908: “One day something brought to my recollection Malthus’ *Principles of Population*, which I had read about twelve years before. I thought of his clear exposition of ‘the positive checks to increase’ – disease, accidents, war and famine – which keep down the population of savage races to so much lower an average than that of more civilized peoples...It then occurred to me that these causes or their equivalents are continually acting in the case of animals also...Why do some die and some live? And the answer was clearly, that on the whole the best fit live.”

the swiftest, and the cunningest live to fight another day. The spectator has no need to turn his thumbs down, as no quarter is given.”³

The survival-of-the-fittest metaphor is but one example of a number of ideas with centuries-old pedigrees that keep reappearing over and over again in many contexts and yet remain remarkably unchanged despite the opposition they face. An interesting challenge to Huxley’s emphasis on within-group struggle for survival, for example, came from the “Russian school of Darwinian critics” (Todes, 1987) most notably Petr Kropotkin. In his book *Mutual Aid*, Kropotkin (1901) argued that the struggle for existence usually leads to cooperation (mutual aid) rather than no-holds-barred gladiatorial competition. Kropotkin believed that the natural inclination of humans, and other animals, was to help one another, not to compete, and thus building on the natural tendency of human to cooperate would lead to a just and peaceful society (Dugatkin, 2011). According to Gould (1988), Kropotkin saw a dichotomy within the term “struggle for existence.” On one hand, organisms of the same species competed for limited resources and, on the other hand, all organisms struggled against a hostile environment, leading to cooperation.⁴ Darwin himself developed the concept of group-level selection to explain other-

³ Interestingly, after moving from commercial England to the biological world, the idea of natural selection through competition quickly re-entered the realm of social philosophy to be adopted by social conservatives as a justification for the “natural harmony” of unrestrained capitalism. Spencer was one of a number of writers in the nineteenth century to use the biological analogy to argue for a non-interventionist policy in economic and social affairs, see Hodgson (1993).

⁴ Gould (1988) and Todes (1987) point out that Darwin and Wallace did their field work in the tropics where a cacophony of species struggle with each other to gain a foothold, while Kropotkin worked in Siberian Russia where a few species struggled to survive in a harsh environment.

regarding traits in humans and nonhuman species. (Dugatkin, 2006; Gould, 1988; Sober and Wilson, 1998; Sober 2010).⁵

Evolutionary thought during the second half of the 20th century largely rejected the concept of group selection and attempted to explain all adaptations in terms of individual or genetic self-interest (Borello, 2010; Sober and Wilson, 1998). George C. Williams and Richard Dawkins, two of the most influential thinkers during this period, were direct intellectual descendents of Huxley (e.g., Paradis and Williams, 1989). More recently, the idea that natural selection operates at the group level (or more generally, the upper levels of a multi-tier hierarchy) has become acceptable again (Wilson, 2011a). In fact, all evolutionary theories of social behavior assume that interactions take place in a multi-group population, with selection acting within and among the groups (Okasha, 2006; Wilson and Wilson, 2007). Between-group selection is a significant factor in the evolution of many traits and can even result in groups becoming “superorganisms” in their own right, an event known as a major evolutionary transition (Maynard Smith and Szathmary, 1995, 1999; Hölldobler and Wilson, 2009). All of the entities that we currently recognize as individual organisms, such as bacteria, nucleated cells, and multicellular organisms, are the results of major evolutionary transitions, which means that they are highly regulated societies of lower-level entities whose differential reproduction within the society is largely (but not entirely) suppressed. Social insect colonies also qualify as superorganisms, even though their members are physically dispersed. Very recently, a consensus

⁵ In the *Origin* Darwin wrote about the meaning of “the struggle for existence”: “I use this term in a large and metaphorical sense including dependence of one being on another, and including (which is more important) not only the life of the individual, but success in leaving progeny”. “Two canine animals, in a time of dearth, may be truly said to struggle with each other which shall get food and live. But a plant on the edge of a desert is said to struggle for life against the draught, though more properly it should be said to be dependent on the moisture.” Quoted in Todes 1988, page 537.

is forming that human evolution represents a major evolutionary transition, which accounts for our capacity for cooperation and dominance of the earth (Haidt, 2012; Pagel, 2012; Richerson and Boyd, 2005; Turchin, 2005; Wilson, 2011a; E.O. Wilson, 2012).

In economics, in contrast, a recognition of the relevance of group level behavior is lagging behind (Gowdy and Seidel, 2004; Manner and Gowdy, 2010; van den Bergh and Gowdy, 2009). Some progress has been made in behavioral and experimental economics as well as in strategy⁶. However, in the Walras-Pareto general equilibrium paradigm, emphasis is on isolated, self-interested individuals, static optimization, and the coincidence of the social optimum with the general equilibrium of the markets. A critical reflection of its cosmology is still pending. History and cultural context are, for the most part, considered to be outside the purview of economic analysis (as in Gul and Pensdorfer, 2005).⁷ The intractabilities of welfare economics may be widely recognized by theoretical economists, but most applied work appearing in the major economic journals still focuses on marginal analysis of self-regarding individuals in a near-to-equilibrium system. Consumers (or their representative agent) are assumed to be rational and

⁶ Such insights are evidently manifest in the business environment where Nalebuff and Brandenburger (1997), for example, observe ‘co-opetition’; the combination of competition and cooperation as a game theory strategy that changes the game of business. Hamel, Doz and Prahalad (1989), taking a more cautious approach (‘cooperation has its limits’), also perceive a strong case for collaboration (entry into new markets, product development, acquisition of new knowledge, skills and technologies). More recently, Kim and Mauborgne’s (2004), in their ‘Blue Ocean Strategy’ perspective, contrast the ‘red blood’ of competition with the ‘blue oceans’ of opportunity and uncontested market space. While Prahalad and Krishnan (2008), expanding the same thinking to global and virtual networks, argue that ‘co-created value’ is the way forward for modern business.

⁷ Gul and Pensdorfer (2008) write: “Populating economic models with ‘flesh-and-blood human beings’ was never the objective of economists.” Yet this claim only reflects the authors’ limited knowledge of the history of economic thought. See the response to Gul and Pensdorfer by Camerer (2008).

consistent in whatever choices they make, and firms maximize profit functions in competitive environments.

In the subsequent sections of this article we will explore in more detail how certain assumptions central to canonical economic theory and the resulting attitudes towards policy relate to the above identified core beliefs of the Western cosmology. Accordingly, in Section II we will discuss the views on human nature and compare it to recent insights from evolutionary biology. Section III is devoted to exploring the notion of the invisible hand and its reliance on a particular view of human nature. In Section IV we turn to the idea of the existence of a socially optimal state represented in economics by the general, competitive market equilibrium and discuss how it influences economic policy recommendations. Section V concludes.

II. Is Human Nature Only Egotistical?

It is always disconcerting to discover that ideas we think are new and fresh have in fact been in the air for hundreds if not thousands of years. Sahlins (1996) refers to this as “intellectual vertigo.” The ideas discussed below have been central to the Judeo-Christian world for millennia and are encapsulated and reincarnated in economic theory. These ideas and their associated assumptions continue to shape, and sometimes cloud, our understanding of economy, society, and the relationship of humans to the natural world. A first core belief of the Western cosmology relates to the question of how to interpret human nature, particularly with respect to selfishness.

Already in 1431 Lorenzo Valla wrote:

"And what is the aim of friendship? Has it been sought for and so greatly praised by all ages and nations for any other reasons than the satisfactions arising from the performance of mutual services such as giving and receiving whatever men commonly need? ...As for masters and servants, there is no doubt their only aim is common advantage. What should I say about teachers and students?...What finally forms the link between parents and children if it is not advantage and pleasure?" (quoted in Sahlins, 1996, 399)

In this view, other people are merely a means to enhance individual utility.

A corollary to the selfish individual is the notion of the “noble savage” independent and free from the bonds of society. Thomas Hobbes wrote in *The Citizen* 1651 (quoted in Bowles, 1998):

[Let us] return again to the state of nature, and consider men as if but even now sprung out of the earth, and suddenly (like mushrooms), come full to maturity, without any kind of agreement with each other.⁸

In this logic, the autonomous, self-interested individual is the natural unit of analysis as it was put center stage in economics in the so-called marginalist revolution of the 1870s while abandoning the earlier psychological connotations (see Bruni and Sugden, 2007). Pareto was explicit about this: “It is an empirical fact that the natural sciences have progressed only when they have taken secondary principles as their point of departure, instead of trying to discover the essence of things...Pure political economy has therefore a great interest in relying as little as possible on the domain of psychology” (quoted in Busino, 1964). By relying on an economic model composed of self-regarding rational individuals, economics could be reduced to the study of “the mechanics of utility and self-interest” (Jevons, 1871, 90).

This cosmological element is enshrined in canonical economic theory to the present day. A necessary feature of the Walrasian model is the self-regarding consumer whose utility function is not affected by the utility of others. If this is not assumed, the mathematical proof of the efficiency of competitive equilibrium breaks down (Gowdy, 2004b; Henderson and Quandt, 1980, 297).⁹

⁸ As Lovejoy (1936) argues, this conception of man has divine origins. He quotes Aristotle (Lovejoy, 1936, 42) as follows: “One who is self-sufficient, can have no need of the service of others, nor of their affection, nor of social life, since he is capable of living alone. This is especially evident in the case of God. Clearly, since he is in need of nothing, God cannot have need of friends, nor will he have any”

⁹ To be clear about this, one could certainly construct a utility function where the well-being of consumer A depends on the well-being of consumer B, as in $U_A = F(X, Y, U_B)$. But this form

The focus on the autonomous individual, independent of society, and the way it plays out in economic theory has political and ideological implications. For example, the isolated actor model underlying the marginal productivity theory of distribution—asserting that an individual’s contribution to economic output can be isolated from the contributions of others—is frequently presented as a moral justification for the economic status quo. In the canonical model, in an ideal market economy people are paid what they deserve, that is, the amount each person contributes at the margin to economic output. In marginal productivity theory only the addition to economic output counts—the social nature of technology and production is ignored (Miller, 2000; Pullen, 2001). The policy implication is clear—you earned your pay in a competitive market, you get to keep it. As D’Souza (2001) puts it: “The guy who is worth little has probably produced little of value. By the same taken, the guy who’s earning twice as much as you is most likely—perish the thought—twice as good as you are.” To consider the social nature of production is to suggest a very different political perspective. Elizabeth Warren (2011) makes this clear:

There is nobody in this country who got rich on his own. Nobody. You built a factory out there—good for you...But I want to be clear. You moved your goods to market on the roads the rest of us paid for. You hired workers that the rest of us paid to educate...Part of the underlying social contract is you take a hunk of that and pay forward for the next kid who comes along.

Economic output and current technology is the result of innumerable advances over the course of human history and the evolution of industrial society. Production is a social, not individual, undertaking.

does not lead to the result that the marginal rates of substitution for commodities are the same for the two consumers and thus one cannot go on to prove the Pareto efficiency of competitive exchange (Henderson and Quandt, 1980, 297). This is *the* major result of canonical welfare economics—the First Fundamental Theorem of Welfare Economics. Utility functions can include “altruism” but they must still be self-regarding—altruism gives *me* utility.

Criticisms of the notion that humans are purely self-regarding go back to the beginnings of modern utility theory. For example, Edgeworth (1881) included a term accounting for pure altruism in his theory of exchange which he called a “coefficient of effective sympathy.” Veblen’s (1898) criticism of the neoclassical concept of humans as a coldly calculating “homogeneous globules of desire” is still one of the most insightful in the literature. Another early criticism is that of Georgescu-Roegen (1954) who argued that individual utility depends not only on individual well-being but also the well-being of the community to which the individual belongs. Similarly, a long list of authors such as Kapp (1950), Mishan (1967), Scitovsky (1976), Sen (1977) Ostrom (2005), and Witt (2010) to mention just a few have emphasized the social nature of human decision-making.¹⁰ The assumption of self-regarding, perfectly rational behavior is also embedded in the micro-foundations approach to macroeconomics. The avalanche of micro-founded, rational expectations models since the 1970s has accordingly driven out all psychological conjectures still present in Keynesian macroeconomics. Moreover, these models implicitly suggest that causality in economic change moves only upward from the level of the individual to the super-individual level. This simplification ignores that there are also causal effects in the opposite direction. Group level phenomena, for instance, can affect individual behavior, because the presence of groups can change the behavior of individuals interacting with each other. These interactions can, in turn, affect the economic system as a whole. The combination of individuals and groups means that

¹⁰ A large number of economic models have been constructed to explain altruism, charity, benevolence, and bequests. However, in doing so, many economists and other social scientists have been ingenious in finding explanations for the motives for such behavior precisely in the pursuit of self-interest. Possible selfish motivations leading to apparently altruistic behavior include enlightened self-interest, pursuit of reputation, anticipation of reciprocity, and fear. Further explanations are that personal utility may be derived from someone else’s satisfaction, or that benefits may arise from the adherence to a social contract (Arrow, 1987).

upward and downward causation operate simultaneously (Gowdy, 2004a; van den Bergh and Gowdy 2009).

Despite strong beliefs implicit in canonical economics, the evidence from neurobiology, psychology, and behavioral economics on human behavior in economic contexts is clearly at odds with the model of a purely autonomous, rational actor. Results from now classic behavioral experiments like the ultimatum games, the public goods game and even the one-shot prisoner's dilemma indicate that economic behavior can to a considerable extent be other-regarding (Henrich et al., 2004).¹¹ The behavioral evidence is verified by neuroscience confirming the existence in humans of the "social brain" (Frith and Frith, 2010). Humans are capable of putting themselves in the shoes of others, understanding their intentions, and feeling empathy for them (Tomasello, 1999). The degree to which this social intelligence is "hard-wired" into the human brain is almost unique among mammals. New findings about the structure of the human brain show that it is designed for sociality (Wexler, 2006).

On the other hand, human social intelligence not only helps coordination and cooperation by understanding the intentions of others, it can also be used to out-compete rivals, where competition prevails. Empathy for some fellow citizens may often coexist with antipathy for others. Competitive behavior is a natural attitude in many contexts, and competition between members of society is a pervasive phenomenon. The decisive point is to recognize that self-regarding behavior is neither the only natural attitude nor the exclusive form of human

¹¹ For decades the classic defense of the rational actor model was that, although the underlying assumptions are unrealistic, it makes good predictions of actual behavior. Since that defense has been demolished, the fallback position is that the model gives "insights." "Faced with a choice between a theory which predicts well but gives us little insight into how the system works and one which gives us insight but predicts badly, I would choose the later." (Coase, 1995, 17)

interaction – not even in markets. The balance between cooperation and competition is delicate, but essential for understanding both human sociality and the way in which economies operate.

Put differently, where competitive behavior is in some cases beneficial in activating the human propensity to "truck and barter" (Smith, 1776), in other cases it can trigger welfare losses or even anti-social behavior. For example, as Robert Frank (2011) has argued, status races for the biggest houses or most expensive cars can waste resources without actually raising anyone's welfare. In this case, constraining competition by appropriate policy measures such as progressively taxing consumption may make all people better off. A similar point was made by Layard (2005) who distinguished between competitive and non-competitive goods. Experimental evidence indicates that if everyone receives a higher income, relative position does not change and soon the beneficial effects wear off. Leisure time, on the other hand, is not a competitive good. If everyone receives more vacation time, all are better off.¹²

The emerging consensus among evolutionists that humans are a highly group-selected species challenges the individualistic assumption of economics at its core. A more profitable unit to theorize about is the small face-to-face group, whose members are interdependent and capable of suppressing self-serving behaviors at low personal cost (e.g, gossip; Boehm, 2012; Wilson et al., 2000; Kniffin and Wilson, 2005). This was the human social environment for many thousands of generations, prior to the advent of agriculture only about 13,000 years ago. Economic assumptions about human social preferences should be based upon the psychological traits that evolved to enable human groups to function adaptively at this scale. Large-scale social institutions must be understood as a product of cultural evolution in which culturally derived

¹² Ng (1987) has argued that taxing goods purchased for conspicuous consumption (Veblen goods) is a win-win exercise. The people who buy them are happier since the higher price allows them to gain even more prestige and the government gets more tax revenue.

traits interface with genetically evolved psychological traits. Considerable progress along these lines has already been made by economists and members of other human-related disciplines who have become knowledgeable about current evolutionary thought (e.g., Henrich et al., 2004; Richerson and Boyd, 2005).

III. Does Self Interest Lead to Social Harmony?

The “invisible hand” of the market is one of the best-known metaphors in Western cosmology. The idea is often traced to Mandeville’s (1709) *Fable of the Bees or Private Vices, Public Benefits* (Fraud, Luxury and Pride must live/While we the Benefits receive/Hunger’s a dreadful Plague, no doubt/Yet who digests or thrives without?) or Alexander Pope’s (1734) *Essay on Man* (“Thus God and Nature linked the general frame/And bade Self-love and Social be the same”) but the roots of the metaphor are much deeper. Benardino Telesio in 1565 described the organization of the universe as the result the self-interested actions not only of living things but even inanimate objects:

It is quite evident that nature is propelled by self-interest. In fact, nature can tolerate neither vacuum nor anything without a purpose. All things enjoy touching one another, and maintain and conserve themselves by this mutual contact.¹³

The problem with the notion of an invisible hand guiding the common pursuit of self-interest to contribute to the common good, i.e. result in a spontaneous order or harmony, are its tacit presumptions. Too often – but almost always in the general equilibrium version of the invisible hand – a necessary condition for the alleged beneficial outcome is left out: the condition that human sociality and morals must set limits to the individual pursuit of self-interest. These limits are highlighted by the divide between honesty and fairness vs. deception and exploitation

¹³ Quoted in Sahlins 1996, 400. The connections between economic theory and fundamentalist religion have been well documented (Hilton, 1986; Cox, 1999).

in exchange and the division of labor; or by obedience to the rule of law vs. obedience to violent coercion prevailing in the “spontaneous order” created by the mafia. Adam Smith was well aware of the “social capital” on which the beneficial effect of the division of labor rests. He had a sophisticated sense of human psychology and social behavior, developed most fully in his treatise on moral sentiments (Smith, 1759), which is broadly consistent with the modern evolutionary view (e.g., Gintis et al., 2005). In contrast, the version of the invisible hand informing modern general equilibrium economics focuses selectively on Smith’s (1776) plea for unfettered markets as a source of wealth and welfare.¹⁴

A recourse to evolutionary biology is helpful in bringing out more clearly the conditions under which pro-social dispositions in humans evolved and can still be expected to be active in balancing the pursuit of self-interest. Human cooperative behavior (as pro-social, cooperative behavior in general) is a result of group selection forces. In biology, this claim was originally derived from a naïve group selection theory which assumed that adaptations evolve at all levels of the biological hierarchy without requiring special conditions (Borrello, 2012). While such a naïve interpretation deserved to be critiqued, the categorical rejection of group selection during the middle of the 20th century proved to be an over-reaction. Current multilevel selection theory shows that societies at any given scale can evolve to function adaptively, but only given a process of selection operating at the same scale. When this happens, individual behaviors are selected that cause the group to function well as a whole.¹⁵

¹⁴ It is worth noting that Smith did not claim that man is unconditionally selfish. Subsequent generations of economists have easily overlooked the caveats he made. See Edward Cartwright (2011) for an excellent discussion which reminds us of Smith’s interest in behavioral economics.

¹⁵ This does not require having the welfare of the group in mind in a psychological sense.

In the case of cells within multicellular organisms or insects within social insect colonies, the

In this way, group selection favors traits that increase the fitness of one group relative to other groups (Wilson 1997). Group selection implies that natural selection is more likely to have endowed humans with (contingent) pro-social attitudes than the selfish gene model (or, for that matter, the selfish autonomous economic agent model) would predict. The environment in which selection forces shaped the features of human sociality was that of the small group of early humans. Within such an environment humans can still today be expected to display the inherited the complex mix of self- and other-regarding behaviors. Norms are essential, which are typically emerging by consensus and enforced by a variety of sanctions ranging in intensity from gossip to execution (Boehm, 2012). Status within the group is achieved by enhancing one's reputation, which requires contributing to the welfare of others (Henrich and Gil-White, 2001). Small human groups are highly regulated, just as multicellular organisms and social insect colonies are highly regulated. If this doesn't appear obvious, it is because many of the regulatory mechanisms take place beneath conscious awareness. We take part in the regulatory process without knowing it. Indeed, this may be the true background of the "invisible hand" effect. The complex regulatory machinery provides the starting point for the cultural evolution of functionally organized societies at a larger scale.

Thus, it is not the autonomous, self-interested individual behavior of economic textbooks that is guided by price and income constraints to social harmony. It is rather the sophisticated mix of self- and other-regarding attitudes with which human agents are endowed that allowed the individuals don't even have minds in the human sense of the word. When selection doesn't take place at a given scale, then that scale tends to become dysfunctional, based on selection at lower scales (Wilson, 2004, 2011a).

division of labor and exchange to develop in the first place. The larger the scale and scope of the markets grew, the more cultural and institutional evolution contributed to generalizing the pro-social attitudes to anonymous interactions beyond the small group. In today's world, where new solutions are required to solve new problems at an unprecedented spatial and temporal scale, we need to create a culture that is capable of rapid change more than ever before. Markets that harness the power of competition and self-interest are essential, but unless the negative effects of these forces are held in check, there will be no invisible hand to prevent forms of competition and self-interest that are detrimental to the common good.

IV. Do Economic Systems Have an Optimal State of Being?

The formal model of general equilibrium and Pareto optimality arising from self-interest would not have been possible without the marginalist revolution of the 1870s. But the underlying notion of a harmonious, natural order of the economic world is not a product of thought of the marginalist revolution. The idea that the universe has a harmonious ideal state has a long pedigree and can be found, among others, as early as in the Judaic notion of the (lost) Paradise or Plato's ideal state. It also finds expression in the Newtonian worldview accurately reproduced in Adam Smith's (1795) history of astronomy leading him to adopt the metaphor of the "divine watchmaker". In a sense, thus, this worldview is completed by Walrasian general equilibrium theory when it casts the dynamic and evolutionary energy of capitalism into a purely mechanical, non-human system (Mirowski, 2002).

An instructive example of the deformations of reality due to the mechanic metaphor is the canonical theory of the firm. Firm size, production techniques and employment is shaped by exogenous resources, tastes and technologies. Given the goal of profit maximization and the

assumptions of perfect competition, a firm's adjustment behavior resembles the trajectory of a marble thrown into a round bowl which can only end up at the bottom of the bowl. Milton Friedman (1954) used a “survival of the fittest” argument to justify the idea of competitive equilibrium. Given the assumptions of perfect competition and profit maximization, inefficient firms will be driven out of business. Furthermore, any intervention into the natural order of perfectly competitive markets will allow inefficient firms to survive rather than suffering the consequences of their inefficiency.

Taking this idea further, Friedman argued against any notion of corporate social responsibility. “The only responsibility that corporations have is to increase profits... The real social responsibility of the firm is to obtain the highest profits—obviously in an open, correct and competitive market, producing wealth and work for all in the most efficient way possible” (Friedman 1970). If firms are allowed to deviate from this maxim (e.g. by government intervention), Friedman claims that this will harm the common good by diverting resources from their highest and best use as prescribed by the market. A telling criticism of Friedman is that for selection to work there must be some superior quality or characteristic of a surviving firm that is passed on from generation to generation (Winter, 1964). Without that, Friedman’s argument is a tautology; profit maximizers survive and if a firm survives then it must be a profit maximizer.

Friedman provided an evolutionary argument to justify the canonical theory of the firm, but it wasn’t evolutionary enough (D.S. Wilson, 2012). It represents an example of naïve adaptationism that Stephen Jay Gould and Richard Lewontin (1979) criticized in their classic article titled “The Spandrels of San Marco and the Panglossian Paradigm: A critique of the adaptationist program.” Gould and Lewontin chastised their evolutionary colleagues for telling adaptationist “just-so” stories without adequate proof and for failing to appreciate the many ways

that non-adaptive traits can persist in a population. A more fully rounded evolutionary approach requires pitting a number of adaptationist and nonadaptationist hypotheses against each other with empirical research. It also requires an understanding of proximate mechanisms, development, and phylogeny (=history for cultural evolution), as outlined in the first article of this special issue (Wilson and Gowdy, 2012).

The idea that profit maximization at the level of the firm also maximizes societal welfare cannot be justified from a modern multilevel perspective, unless under highly regulated conditions. Profit maximization might even be detrimental to the firm. Radner and Dutta (1998) showed that firms that maximize profit are actually more likely to go out of business. Countering Friedman, numerous studies (Collins and Porras, 1997; Freeman and Reed, 1983; Freeman, 1984; Martin 2010) document the success of enduring firms, like Johnson and Johnson and Unilever.¹⁶ Such firms challenge the prioritization of profit maximization and, by adopting the more cooperative stakeholder values perspective, take the longer term view instead. Furthermore, the role of co-evolution, symbiosis, and synergy—playing a key role in modern biology for explaining the evolution of eco-systems – should not be underrated for understanding how firms depend on business ecosystems (Moore, 1996). The fiction of an entirely autonomous decision unit is no less misleading for the firm as it is for the individual economic agent.

Nelson and Winter (1982) raise an important additional objection to Friedman's survival of the fittest argument. The economic selection environment is not necessarily exogenous to the firm. Firms can consciously shape the economic environment.¹⁷ This is obviously the case

¹⁶ Unilever was winner of 'Britain's Most Admired Companies Award' 2010, peer-assessed in conjunction with *Management Today*, Andrew Saunders (2010)

¹⁷ A critical observation that nonetheless continues to be overlooked by many organisation scholars and economists. Characterised as the 'adaptation versus selection' debate (Baum, 1996; Lewin and Volberda, 1999) some researchers challenge the 'selectionists' position (Hannan and

whenever firms successfully innovate. The innovative response to competition changes the conditions of competition. Nelson and Winter (1982, 413) argue that "orthodox theory cannot adequately provide that analysis and understanding because, fundamentally, it is about an ahistorical world in which genuine novelties do not arise." This is probably even more true for the political economy by which big corporations tend to use their economic and political power to alter the rules of the game by political partisanship."

The cosmology of a harmonious, ideal state influences economic theorizing not only via the common perception of the general competitive equilibrium as a "natural" state of the economy coinciding with the social optimum. It also contributes to the frequent view of policy making as an "intervention" that tends to disturb harmony. Like the Garden of Eden, the optimal state of nature can only be disturbed by presumptuous human behavior that thinks it knows better than the market (government regulations or labor unions for example). The apparently straight forward conclusion is: If there is an optimal state for an economy—the stable equilibrium to which the economy will always return if perturbed—then the proper policy is to make sure the parameters are properly set (assign property rights and get the prices right) and then leave it alone. But is it so certain that markets that are left alone accomplish a harmonious outcome under all circumstances? Or is policy "intervention" in many cases exactly the opposite of a disturbing influence, namely something that is necessary to bring economic interactions closer to producing an efficient and/or just outcome? In cases of market failure, e.g. due to external effects, it does not seem controversial that the answer is in the affirmative (Wilson 2011b). Yet, often enough acknowledgement of this inherent defect is trivialized by claiming that policy making will not be a remedy because of an equally momentous "policy failure".

Freeman, 1977; 1989) arguing that firm adaptation matters and that it *is* possible to 'change the rules of the game' (Hamel and Prahalad, 1994; Baden, Fuller and Stopford, 1992).

Obviously, in this regard evolutionary biology faces a different situation in its domain. There is no ideal state of nature. Biological evolution is simply a process of adaptation to a continually changing environment – for better or worse as far as the involved species are concerned. This may not always be in the best interest of the human species. For that reason, man-made economic evolution is not simply adaptation to a changing environment. It is an incessant process of tinkering and inventing in order to shift outwards the constraints that nature invokes on the niche of our species (Witt, 2005).

There has undoubtedly been progress in human material welfare. However, while in the richest economies increases in material wealth do not necessarily imply any longer that individual welfare also increases (Witt 2011), a significant portion of the world's population still lives in abject poverty. Market competition has had a significant share in increasing material prosperity. But humankind has also increasingly been risk-taking in terms of environmental degradation, resource depletion, and global ecological stability -- risks that threaten the stability of its expanded niche. Much of this risk taking may be due to myopia, biased time preferences, and hazardous behavior of individual economic agents. In many other cases it may be due to negligence with respect to negative externalities resulting when the enforcement of property rights on environmental resources is prohibitively expensive. Both causes result in an inability of unfettered markets to protect the stability of the human niche. Trusting the problem-solving capacity of markets with respect to the global risks would therefore amount to counterfactually adhering to the belief that unfettered markets under all circumstances assure harmonious outcomes.

If material prosperity is to be preserved, or even to be expanded to all people, political efforts will have to be taken to get control of the risks. It may well be then that individual

myopia, biased time preferences, negligent and hazardous behavior have no less to be faced as a problem in the policy making arena. The obvious failure of politics so far in coping with rising global risks like the human induced climate change cannot be ignored. However, as the work of Ostrom (1990) has shown, there is some evidence that social learning processes and collective decision making can jointly establish constraints on myopia and hazard in the policy arena with its high publicity. Moreover, as argued in the previous section, insight into individual moral responsibility and conscientiousness as a necessary constraint on self-interest within free markets can, and needs to be fostered, not least within economic theory itself. There is still some hope, therefore, that policy regulations can be reached in the public discourse that create the necessary bounds for the free play of the market so as to guide its information processing capacity and incentive character in the sustainable direction that it does not necessarily accomplish by itself . The stakes are high as the lesson from biology teaches: unstable niche expansion by a species sooner or later results in catastrophic breakdown and often the extinction of the species.

IV. Conclusions

Many methodological controversies in economics are rooted in basic beliefs embodied in Western cosmologies that go back for millennia. It is argued above that current breakthroughs in evolutionary biology and neuroscience can inform an emancipation of economic theorizing from the latent cosmological influences and their errors and biases. Evolutionary principles and evidence can be used to compare the model of human nature governed by self-interest in canonical economics with the more complex, socially embedded model of human nature in biology, evolutionary psychology, and neuroscience.

Such a comparison shows that other-regarding explanations fare better than those based on exclusively assuming atomistic, self-interested agents. Likewise, evolutionary theory and

evidence shows that competition at the individual level may not lead to improved fitness for the group. Finally, evolutionary theory and evidence indicates that there is no single optimal state for a particular system as a long-standing tradition in Western cosmology has it. A particular ecosystem or a particular economic configuration is just one of many possible outcomes from an original starting point. These ideas may seem self-evident but they point the way to a new synthesis in economics. Examining the three basic cosmologies embedded in economic theory in such a perspective can help evaluate controversies that have raged in economics for two centuries and actually move the debate along.

References

- Applbaum, K. 1998. The sweetness of salvation: Consumer marketing and the liberal-bourgeois theory of needs. *Current Anthropology* 39, 323-349.
- Arrow, K. 1987. Economic theory and the postulate of rationality. In: Eatwell, J., Milgate, M., Newman, P. (eds.), *The New Palgrave Dictionary of Economics*, vol. 2. MacMillan, London, pp. 69-75.
- Baden-Fuller, C. and Stopford, J. M. 1992. *Rejuvenating the Mature Business*. Routledge, London.
- Baum, J. A. C. 1996. Towards an institutional ecology of organisational founding. *Academy of Management Journal* 39, 1378-1427.
- Boehm, C. 2012. *Moral Origins: The Evolution of Virtue, Altruism, and Shame*. New York: Basic Books.
- Borrello, M. E. 2010. *Evolutionary Restraints: The Contentious History of Group Selection*. Chicago: University of Chicago Press.
- Bowles, S. 1998. Endogenous preferences: the cultural consequences of markets and other economic institutions. *Journal of Economic Literature* XXXVI, 75-111.
- Bruni, L. and R. Sugden. 2007. The road not taken: How psychology was removed from economics, and how it might be brought back. *Economic Journal* 117, 146-173.
- Busino, G. 1964. Note bibliographique sur le Cours. In V. Pareto (ed.) *Epistolario*. Accademia Nazionale dei Lincei, Rome, pp. 1165-1172.
- Camerer, C. 2008. The case for mindful economics. In: *The Foundations of Positive and Normative Economics*. A. Caplin and A. Schotter (eds.), Oxford University Press, Oxford, pp. 43-69.
- Cartwright, E. 2011. *Behavioral Economics*. Routledge, Abingdon, Oxon
- Coase, R. 1995. *Essays on Economics and Economists*. University of Chicago Press, Chicago.
- Collins, J. C. and Porras, J. 1994. *Built to Last: Successful Habits of Visionary Companies*. Random House, London.
- Cox, H. 1999. The market as god. *The Atlantic Monthly*, March.
- Darwin, C. 1958 [1876]. *The Autobiography of Charles Darwin*. W.W. Norton, New York.
- D'Souza, D. 2001. *The Virtue of Prosperity*. Touchstone, New York.

- Dugatkin, L. 2006. *The Altruism Equation: Seven Scientists Search for the Origins of Goodness*. Princeton University Press, Princeton, NJ.
- Dugatkin, L. A. 2011. *The Prince of Evolution: Peter Kropotkin's Adventures in Science and Politics*. Seattle Washington: Create Space.
- Edgeworth, F. 1881. *Mathematical Psychics*. L.S.E. Reprint 1934, London.
- Frank, R. 2011. *The Darwin Economy: Liberty, Competition, and the Common Good*. Princeton, University Press, Princeton, NJ.
- Freeman, E. 1984. *Strategic Management: A Stakeholder Approach*. Pitman/Ballinger, Boston.
- Freeman, E. and Reed, D. L. 1983. Stockholders and stakeholders: A new perspective on corporate governance. *California Management Review* 25, 88-106.
- Friedman, M. 1954. The methodology of positive economics. In *The Methodology of Positive Economics*. University of Chicago Press., Chicago.
- Friedman, M. 1970. The social responsibility of business is to increase its profits. *New York Times Magazine*, September 13, p. 2.
- Frith, U. and Frith, C. 2010. The social brain: allowing humans to boldly go where no other species has been. *Philosophical Transactions of the Royal Society B* 365, 165-175.
- Georgescu-Roegen, N. 1954. Choice, expectations, and measurability. *Quarterly Journal of Economics* 63, 503-534.
- Gintis, H., Bowles, S., Boyd, R., & Fehr, E. (Eds.). 2005. *Moral Sentiments and Material Interests: The Foundations of Cooperation in Economic Life*. Cambridge, MA: MIT Press.
- Gould, S.J. 1988. Kropotkin was no crackpot. *Natural History* 97, 12-21.
- Gould, S.J. and R. Lewontin. 1979. The spandrels of San Marco and the Panglossian paradigm: a critique of the adaptationist programme. *Proceedings of the Royal Society of London B* 205, 581-598.
- Gowdy, J. 2004a. Altruism, evolution, and welfare economics. *The Journal of Economic Behavior and Organization* 53, 69-73.
- Gowdy, J. 2004b. The revolution in welfare economics and its implications for environmental valuation. *Land Economics* 80, 239-257.
- Gowdy, J. and I. Seidl. 2004. Economic man and selfish genes: The relevance of group selection to economic policy. *Journal of Socio-Economics* 33, 343-358.

- Gul, F. and Pensdorfer, W. 2008. The case for mindless economics. In: *The Foundations of Positive and Normative Economics*. A. Caplin and A. Schotter (eds.), Oxford University Press, Oxford, pp. 3-42.
- Haidt, J. (2012). *The Righteous Mind: Why Good People are Divided by Politics and Religion* New York: Pantheon.
- Hamel, G. Doz Y. L. and Prahalad C. K. 1989. Collaborate with your competitors - and win. *Harvard Business Review* 67, 133-139.
- Hannan, M. T. and Freeman, J. 1977. The population ecology of organizations. *The American Journal of Sociology* 82, 929-964.
- Hannan, M. T. and Freeman, J. 1989. *Organizational Ecology*. Harvard University Press, Cambridge, MA.
- Henderson, J. and Quandt, J. 1980. *Microeconomic Theory: A Mathematical Approach*. McGraw Hill, New York.
- Henrich, J. 2004. Cultural group selection, coevolutionary processes and large-scale cooperation. *Journal of Economic Behavior and Organization* 53, 3-35.
- Henrich, J., Boyd, R., Bowles, S., Camerer, C., Fehr, E., Gintis, H. (eds.) 2004. *Foundations of Human Sociality*. Oxford University Press, Oxford.
- Henrich, J., & Gil White, F. (2001). The evolution of prestige: freely conferred status as a mechanism for enhancing the benefits of cultural transmission. *Evolution and Human Behavior*, 22, 1-32.
- Hilton, B. 1986. *The Age of Atonement: The Influence of Evangelicalism on Social and Economic Thought 1785-1865*. Clarendon Press, Oxford.
- Hodgson, G. 1993. *Economics and Evolution: Bringing Life Back into Economics*. University of Michigan Press, Ann Arbor.
- Hölldobler, B. and E. O. Wilson. 2009. *The Superorganism*. New York: W.W. Norton.
- Huxley, T. 1888. The struggle for existence and its bearing on man. In *Collected Essays*, vol. IX. Macmillan, London
- Jablonka, E. and Lamb, M. 2006. The evolution of information in the major transitions. *Journal of Theoretical Biology* 239, 236-246.
- Jevons, W. S. 1871 (1970). *The Theory of Political Economy*. Penguin, London.
- Kapp, W. 1950. *Social Limits to Growth*. Harvard University Press, Cambridge, MA.

- Kim, W.C. and Mauborgne, R. 2004. Blue ocean strategy. Harvard Business Review, October: 2-11.
- Kniffin, K. M., & Wilson, D. S. 2005. Utilities of gossip across organizational levels: multilevel selection, free-riders, and teams. Human Nature, 16, 278-292.
- Kropotkin, P. 1901. Mutual Aid: A Factor in Evolution. William Heinemann, London.
- Layard, R. 2005. Happiness: Lessons from a New Science. The Penguin Press, New York.
- Lewin, A. Y. and Volberda, H. W. 1999. Prolegomena on coevolution: A framework for research on strategy and new organizational form. Organization Science 10, 519-534.
- Lorenzoni, G. and Baden Fuller, C. 1995. Creating a strategic centre to manage a web of partners. California Management Review 37, 146-163.
- Lovejoy, T. 1936. The Great Chain of Being. Harvard University Press, Cambridge, MA.
- Mandeville, B. 1705. The Fable of the Bees Available at:
<http://jacobhedegaard.dk/economics/fable-of-the-bees.pdf>
- Manner, M. and Gowdy, J. 2010. Group selection and the evolution of moral behavior: Toward a coevolutionary foundation for public policy. Ecological Economics 69, 753-69.
- Margulis, L. 1998. Symbiotic Planet. Basic Books, New York.
- Martin, R. 2010. The age of consumer capitalism. Harvard Business Review. January-February: 58-65.
- Maynard Smith, J., & Szathmary, E. 1995. The major transitions of life. New York: W.H. Freeman.
- Maynard Smith, J., & Szathmary, E. 1999. The origins of life: from the birth of life to the origin of language. Oxford: Oxford University Press.
- Miller, R. 2000. Ten cheaper spades: Production theory and cost curves in the short run. Journal of Economic Education, 119-130.
- Mirowski, P. 2002. Machine Dreams: Economics Becomes a Cyborg Science. Cambridge University Press, Cambridge, UK.
- Mishan, E. J. 1967. The Costs of Economic Growth. Praeger, New York.
- Moore, J. 1996 The Death of Competition: Leadership and Strategy in the Age of Business Ecosystems, HarperBusiness, New York.

- Nalebuff, B. J. and Brandenburger, A. M. 1997. Coopetition: competitive and cooperative business strategies for the digital economy. *Strategy and Leadership* 25, 28-35.
- Nelson, R. and Winter, S. 1982. *An Evolutionary Theory of Economic Change*. Harvard University Press, Cambridge, MA.
- Nowak, M. and Highfield, R. 2011. *Super Cooperators: Altruism, Evolution, and Why We Need Each Other to Succeed*, Free Press, New York.
- Nowak, M., Tarnita, C., Wilson, E.O. 2010. The evolution of eusociality. *Nature* 466, 1957-1062.
- Ng, Y-K., 1987. Diamonds are a government's best friend: burden-free taxes on goods valued for their values. *American Economic Review* 77, 186-191.
- Okasha, S. 2006. *Evolution and the levels of selection*. Oxford, UK: Oxford University Press.
- Ostrom, E. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge University Press, Cambridge, MA.
- Ostrom, E. 2005. *Understanding Institutional Diversity*. Princeton University Press, Princeton, NJ.
- Pagel, M. 2012. *Wired for Culture*. New York: Norton.
- Paradis, J. G., & Williams, G. C. 1989. *Evolution and Ethics: T.H. Huxley's Evolution and Ethics with New Essays on its Victorian and Sociobiological Context*. Princeton: Princeton University Press.
- Pope, A. 1734. *Essay on Man*. The complete text is available at: <http://www.gutenberg.org/files/2428/2428-h/2428-h.htm#startoftext>
- Prahalad, C.K. and Krishnan, M.S. 2008. *The New Age of Innovation: Driving Cocreated Value Through Global Networks*. McGraw Hill, New York.
- Pullen, J. 2001. A linguistic analysis of the marginal productivity theory of production; or the use and misuse of the proprietorial "is". Working paper, University of New England, New South Wales, Australia, available at: <http://www.une.edu.au/bepp/working-papers/economics/1999-2007/econwp01-4.pdf>.
- Radner, R. and Dutta, P. 1998. Profit maximization and the market selection hypothesis. *The Review of Economic Studies* 66, 769-798.
- Reeves, M. and Deimler, M. S. 2009. *New Bases of Competitive Advantage: The Adaptive Imperative*. The Boston Consulting Group, Inc., Boston.

- Richerson, P. and Boyd, R. 2005. *Not by Genes Alone*. University of Chicago Press, Chicago.
- Sahlins, M. 1996. The sadness of Sweetness: the native anthropology of Western cosmology. *Current Anthropology* 37, 395-428.
- Saunders, A. 2010. A bumpy ride that's far from over. *Management Today*, December: 32-39
- Scitovsky, T. 1976. *The Joyless Economy*. Oxford University Press, New York.
- Sen, A. 1977. Rational fools: a critique of the behavioral foundations of economic theory. *Philosophy and Public Affairs* 6, 317-344.
- Smith, A. 1795. *Essays on Philosophical Subjects*, Reprint 1976, Oxford University Press, Oxford.
- Smith, A. 1776. *An Inquiry into the Nature and Causes of the Wealth of Nations*, Strahan and Cadell. London.
- Smith, A. 1759. *The Theory of Moral Sentiments*. A. Millar, London.
- Sober, E. 2010. Darwin and Group Selection. In E. Sober (Ed.), *Did Darwin Write the Origin Backwards: Philosophical Essays on Darwin's Theory* (pp. 45-86). Amherst, NY: Prometheus.
- Sober, E. and Wilson, D.S. 1998. *Unto Others*. Harvard University Press, Cambridge, MA.
- Todes, D. 1987. Darwin's Malthusian metaphor and Russian Evolutionary Thought, 1859-1917. *ISIS* 78, 537-551.
- Tomasello, M. 1999. *The Cultural Origins of Human Cognition*. Harvard University Press, Cambridge, MA.
- Turchin, P. 2005. *War and Peace and War*. Upper Saddle River, NJ: Pi Press.
- van den Bergh, J. and Gowdy, J. 2009. A group selection perspective on economic behavior, institutions and organizations. *Journal of Economic Behavior and Organization* 72, 1-20.
- Veblen, T. 1898. Why is economics not an evolutionary science? *Quarterly Journal of Economics* 12, 373-397.
- Wallace, A. R. 1908. *My Life: A Record of Events and Opinions*. Dodd, Mead & Company, New York.
- Walras, L. 1874 [1977]. *Elements of Pure Economics*. Augustus Kelley, Fairfield, CT.

Warren, E. 2011. "Video: The Elizabeth Warren Quote Every American Needs To Hear," MoveOn.org, Sept. 21, 2011. <http://www.moveon.org/r?r=264488&id=31551-4512200-GeY1vhx&t=4>

Wexler, B. 2006. Brain and Culture. MIT Press, Cambridge, MA.

Wilson, D.S. 1997. Introduction: Multilevel selection theory comes of age. *American Naturalist* 150, S1-S4.

Wilson, D.S. 2002. Darwin's Cathedral: Evolution, Religion and the Nature of Society. University of Chicago Press, Chicago.

Wilson, D.S. 2004. The new fable of the bees: Multilevel selection, adaptive societies, and the concept of self-interest. *Evolutionary Psychology and Economic Theory* 7, 201-220.

Wilson, D. S. 2011a. Instant Expert: Evolution of Selfless Behavior. *New Scientist*, doi:10.1016/S0262-4079(11)61857-5

Wilson, D. S. 2011b. The Neighborhood Project: Using Evolution to Improve My City, One Block at a Time. New York: Little, Brown.

Wilson, D. S. 2012. A Tale of Two Classics. *New Scientist*. March 23 2012. [http://dx.doi.org/10.1016/S0262-4079\(12\)60754-4](http://dx.doi.org/10.1016/S0262-4079(12)60754-4)

Wilson, D. S., Wilczynski, C., Wells, A., & Weiser, L. 2000. Gossip and other aspects of language as group-level adaptations. In C. Heyes & L. Huber (Eds.), *Cognition and Evolution* (pp. 347-365). Cambridge, MA: MIT Press.

Wilson, D.S. and Gowdy, J. 2012. Evolution as a General Theoretical Framework for Economics and Public Policy. *Journal of Economic Behavior and Organization* (in press)

Wilson, D. S. and Wilson, E. O. 2007. Rethinking the theoretical foundation of sociobiology. *The Quarterly Review of Biology* 82, 327-348.

Wilson, E. O. 2012. The Social Conquest of Earth. New York: Norton.

Winter, S. 1964. Economic 'natural selection' and the theory of the firm. *Yale Economic Essays* 4, 225-272.

Witt, U. 2005. Production in nature and production in the economy: Second thoughts about some basic economic concepts. *Structural Change and Economic Dynamics* 16, 165-179.

Witt, U. 2010. Symbolic consumption and the social construction of product characteristics. *Structural Change and Economic Dynamics* 21, 17-25.

Witt, U. 2011. The Dynamics of Consumer Behavior and the Transition to Sustainable Consumption Patterns. *Environmental Innovation and Societal Transition* 1(1), 109-114.