

THE 'IN-BETWEEN' OF MODERN ECONOMY: FROM COMPETITION TO COMPLEMENTARITY

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Abstract

The imperative to grow is essential to all modern societies; to maintain their welfare infrastructures the economy of modern societies is expected to increase at a steady pace annually. Consumerism – a steadily growing material consumption which does not necessarily contribute to increased health or happiness – can be seen as a socio-cultural development influencing the ecological balance of the earth. The ethical values we treasure most within our personal lives, such as trust, honesty, respect, empathy and cooperation, are very different from the basic values of the free market-economy which are based on the idea of maximizing self-interest and competition. Organizational ethical reporting should measure moral, cultural, social and environmental performances, thus doing justice to the double imperative of humanizing and naturalizing the economy. The success of such ethical measurements is essential for a process of transformation of our societies to begin.

Keywords: Modern Economy. Competition. Humanization of the Market.

Resumo

O imperativo de crescer é essencial para todas as sociedades modernas; para manter suas infra-estruturas de bem-estar, a economia das sociedades modernas deverá aumentar a um ritmo constante, anualmente. O consumismo - um consumo crescente de material que não necessariamente contribui para o aumento da saúde ou felicidade - pode ser visto como um desenvolvimento sócio-cultural que influencia o equilíbrio ecológico da terra. Os valores éticos que valorizamos mais em nossas vidas pessoais, como confiança, honestidade, respeito, empatia e cooperação, são muito diferentes dos valores básicos da economia de mercado livre, que são baseados na ideia de maximizar o interesse próprio e a competição. O relato ético organizacional deve medir desempenhos morais, culturais, sociais e ambientais, fazendo justiça ao duplo imperativo de humanizar e naturalizar a economia. O sucesso de tais medidas éticas é essencial para começar um processo de transformação de nossas sociedades.

Palavras-chave: Economia Moderna. Competição. Humanização do Mercado.



1 INTRODUCTION

The collision between the growth of our modern world economy and the tangible limitations of our planetary resources seems inevitable. If all humanity rises to the standard of living of most developed countries, the world economy will ultimately collapse. The imperative to grow is essential to all modern societies; to maintain their welfare infrastructures the economy of modern societies is expected to increase at a steady pace annually. It is clear that the relatively fragile stability of the planetary climate is at stake and a lot of the damage to the regenerative capacity of our planet is now known to be irreversible. Since the publication of the Limits to Growth report of the Club of Rome (1972) several updates (RANDERS, 2012; MEADOWS *et al*, 2004, 1992) show that, if growth is to continue at current rates, humanity will overshoot the planetary boundaries and collapse sometime before 2100. In ‘Planetary Boundaries. Exploring the Safe Operating Space for Humanity’ Johan Rockström, Will Steffen and 25 other co-authors (2009) identify nine planetary life support systems essential for human survival. The authors show that three of these have already been pushed too far which produces a risk of irreversible and abrupt environmental change making the earth less habitable. Certainly, these boundaries are still rough, first estimates surrounded by large uncertainties and knowledge gaps that interact in complex ways. Ecosystem services that are essential for human economy, such as raw materials production, pollination, biological control of diseases, water supply, pollution control, nutrient cycles, soil building and maintenance, and climate regulation could become seriously unbalanced.

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Although the validity of the planetary boundaries model is still under debate, the notion that our economy has exceeded the earth’s carrying capacity is also supported by the ‘Ecological Footprint model’ (MCLELLAN, 2014). This model suggests that we currently require 1.5 planets to provide the resources we use and to absorb our waste. An estimate of 3 planets is expected by 2050 if current average trends of production and consumption continue. All this indicates that the notion of infinite economic growth is utterly flawed.

On the theoretical level there still exists an important discrepancy between classical economic and (relatively) new ecological views on growth. Etymologically, both ‘economy’ and ‘ecology’ are derived from the Greek word ‘Oikos’, meaning ‘household’ – and this, of course, suggests a proximity of economy and ecology that is still lacking in many theoretical and philosophical approaches to economics (ORELL, 2010, p. 214). Both of the suffixes ‘nomos’ and ‘logos’ suggest a similar concern with the regulation of the household but there are divergent opinions about what the ‘household’ actually is. Do we just mean the multilayered

domain of trade exchanges? Do we mean the domain of human social relations and societal structures? Or do we mean the economic, social and ecological infrastructure all at once? Holistic theories underscore the necessity of considering all these things together. But such approaches are still far from being mainstream in both the academic domain and everyday life practice. The progressive depletion of resources and the additional costs of material recycling could lead to stagnation or even to a decline of economic growth that could end up in a recession or in a downward economic spiral with increasing levels of unemployment and debt. The increasing amount of debt in fact pushes the system towards further growth. The current financial system, which generates all this debt, can therefore no longer be perceived as independent and neutral. It is part – both as a cause and as an effect – of our current ecological crisis (TOXOPEUS & ARKEL, 2014; LIETAER *et al*, 2012). Also, socio-cultural developments, such as the growing inequality of wealth distribution, are destabilizing factors influencing the wellbeing of the planet (PIKETTY, 2014; LIETAER *et al*, 2012, 2010). And, of course, consumerism – a steadily growing material consumption which does not necessarily contribute to increased health or happiness – can be seen as a socio-cultural development influencing the ecological balance of the earth (JOSEPH, 2014; BREGMAN, 2014; SCHARMER & KAUFER, 2013; CAPRA, 2009; DALY & COBB, 1989). It is also clear that an increase of the Gross Domestic Product is not an adequate indicator of wellbeing. Besides these socio-cultural economic factors, this issue also concerns the ethical values which are dominant in our culture (MCMURTRY, 2013; SCHARMER & KAUFER, 2013; FELBER, 2010). The ethical values we treasure most within our personal lives, such as trust, honesty, respect, empathy and cooperation, are very different from the basic values of the free market-economy which are based on the idea of maximizing self-interest and competition. According to Christian Felber, this socio-cultural contradiction is splitting our inner worlds, both on the individual and on the social level (2010, p. 21).

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Summarizing, we may say that socio-cultural contradictions contribute to an uneasiness that mobilizes people to take action (in forms of civil unrest which are not only of the left) and this pushes groups against each other. Fritjof Capra summarizes the necessity of a holistic and complexity approach as follows: “The major problems of our time – energy, the environment, climate change, population growth, food shortages, economic and financial crises – cannot be understood in isolation. They are systemic problems, which means that they are all interconnected and interdependent” (2009, p. 11).

We are now progressively discovering that the modern rules or ‘nomoi’ of the economic household are not compatible with the ‘logos’ of ecosystems. It is, however, possible to

reconcile economic theory and ecology and we can learn from older paradigms without looking backwards. This paper is future-oriented and it argues that our economy can develop the balanced dynamics naturally existing in ecosystems. In this paper we explore the structure of an economy that is truly compatible with the ecological boundaries of our planet. It shows in what specific ways economic theory can incorporate the logic of the sustainable growth patterns of living networks in order to create a system that maintains prosperity and wealth. The logic of systems theory clearly shows that in the biological world exponential growth curves belong to a particular development phase – called the ‘competitive phase’ – of self-organizing living beings. This development is followed by a ‘complementary phase’ which generates a relatively steady-state configuration and a relatively sustainable relationship between living beings and their environment. We do not think that this analogy with biological development holds completely for our modern society, since our culture is not primarily steered by natural selection but by human decision making and reflection. We will therefore defend the position that a system theory cannot merely be based on a naturalistic paradigm – be it physical (thermodynamics) or biological (autopoiesis). In order to understand the transformations that lie ahead of us, we cannot just start from the idea of a ‘naturalization of the economy’, of an economy that becomes in tune with nature; we must also introduce the idea of a ‘humanization of the economy’. Although it is possible and even fruitful to acknowledge the complementary phase in the economy, we also need to recognize that the new situation can best be summarized by the idea of a ‘moralization of the economy’. And this refers to a situation in which ethical responsibility becomes the guiding principle of all economic transactions. Georg Wilhelm Friedrich Hegel was in fact the first philosopher to have conceived a morally colored transformation of modern capitalism. The moralization of the economy, as we understand it, encompasses environmental ends (the naturalization of the economy), but also the production of nonmaterial goods (the humanization of the economy), which will benefit the ethical, social and cultural life of everyone.

In order to understand this change in the way we think about modern markets we need to look into the heart of our socio-economic system. The Aristotelian distinction between ‘Chrematistics’ (the art of accumulation of money by means of commerce and/or speculation) and ‘Oikonomia’ (the art of household welfare) is still helpful in order to understand what the heart of our economic system is (STAHEL, 2006; DALY & COBB, 1989; ARISTOTLE, 1967). Our modern economic system originates in a historical context that can be compared to the ‘competitive development phase’ of living networks. While the current context is rapidly changing, the competitive rules and aims of the socio-economic system are still in place. The

major problems we are facing today are systemic in nature, taking place simultaneously at three levels: the ecological, the economic-financial and the socio-cultural level. We can therefore speak of a 'systemic crisis' because all these problems are interlinked. They are a consequence of the inherent dynamics of our modern socio-economic structures (LIETAER, 2012; HEINBERG, 2011; BEINHOCKER, 2007; CAPRA, 2004, 1996). This multilayered systemic crisis, however, shows that we are living in an 'In-between' of two development phases.

To develop this 'In-between' we will draw from complex systems theory which is an approach that emphasizes the macroscope of developments and focuses on general patterns. This is, as we said above, holistic, focusing on nonlinear relationships and systemic structures, emphasizing interconnectivity and interdependency. We are not approaching nonlinear relationships mechanistically, but organically, as an organic development (MORIN, 2008B, 1999; CAPRA, 2002; CILLIERS, 1998; GLEICK, 1988; ROSNAY, 1979). We would like to call this approach the 'holistic complexity' paradigm, because on the one hand complexity perspectives are always holistic and on the other 'holism' emphasizes the idea of an organic self-organized structure. 'Holistic complexity' literature combining insights from both the economic and ecological perspectives has been growing since the 1980s. Main authors in this field are Herman Daly (2014, 2004, 1989), Nicholas Georgescu-Roegen (1971), Howard Odum (2007) and Edgar Morin (2008b), who all incorporated thermodynamic models into socio-economic theory. They thereby emphasize the importance of the relationship of energy, environmental stability and economic sustainability. These authors are still largely ignored within the traditional field of economic scholarship. Other authors, like James Lovelock (2006, 1979), Fritjof Capra (2007, 1996), Peter Corning (2005) and Alexei Kurakin (2011, 2009, 2007) have been focusing on complexity theory and sustainability in order to get a deeper understanding of the systemic features of sustainable societies. Also starting from a 'holistic complexity' paradigm we find many authors who have been deepening the critique of modern economic structures (JOSEPH, 2014; RIFKIN, 2014; SCHARMER & KAUFER, 2013; ORREL, 2012; ROTMANS, 2012; HEINBERG, 2011; EISENSTEIN, 2009; JACKSON, 2009; BEINHOCKER, 2007; WIELINGA, 2001). This critique has recently also been extended to the monetary system and its relationship to forced economic growth (TOXOPEUS & ARKEL, 2014; HO, 2013; LIETAER, 2013, 2012; ROBERTSON, 2012; EISENSTEIN, 2009).

According to these authors sustainability is never going to be reached without changing the monetary system. We think that all these approaches converge in the idea of a coherent and ethical alternative for modern capitalism that has been summarized under the concept of 'Economy for the Common Good' by several authors (ARNOULD & AURENCHE, 2017;

TIROLE, 2016; SUÁREZ MÜLLER & FELBER, 2016; FELBER, 2010; SIKORA, 2001; LUTZ, 1999; DALY & COBB, 1989).

So in this paper we will use a ‘holistic complexity’ approach to consider a wide range of ideas about the transition from the competition phase to that of complementarity. An analytical reductionist approach would not fit our purpose because we want to show that this historical transition involves a complexity of changes, although the general scope makes it possible to discern a development that, as we have said above, can be called the ‘moralization of the markets’ (HERZOG & HONNETH, 2014; STEHR, HENNING & WEILER, 2006; HEGEL, 1968A). As Joël de Rosnay (1979) has shown, ‘holistic complexity’ research is never about zooming in on just one issue: its basis is the so-called ‘macroscope’. The macroscope is neither a microscope nor a telescope – which are merely physical tools – it is, rather, a new way of approaching things: “The macroscope filters details and amplifies that which links things together. It is not used to make things larger or smaller but to observe what is at once too great, too slow, and too complex for our eyes (human society, for example, is a gigantic organism that is totally invisible to us). (...) Our glance must be directed toward the systems which surround us in order to better understand them before they destroy us” (1979, 6/7). We will focus on global developmental patterns, which despite their unpredictability, may offer some guiding principles to understand our historical situation (KURZ & SNOWDEN, 2003, p. 468). This situation requires a major change in our humanistic understanding of the world. The traditional anthropocentric view that characterized modern humanism since the Renaissance is clearly outdated. We need to consider humanity as being part of a wider community (SUÁREZ MÜLLER, 2017a; MANSCHOT, 2010). The major changes of our time are mentality changes. The systemic crisis carries us to a phenomenology of the modern spirit that discerns major changes in the relationship between ethics on the one hand and organizational aspects of society, specifically economic aspects, on the other. The hierarchies of values are shifting – a transformation that Hegel describes as the transition from bourgeois society (based on competition and self-interest) towards an ethical civil society (based on an intrinsic commitment to the common good). No subsystem of society – neither in its theoretical structure nor in practice – can be allowed to continue to neutralize moral values. Thus moral values should become the constitutive principles structuring the core economic processes.

In order to show that we are now in an ‘In-between’ of two development phases – the competitive and the complementary – we want to first understand what the limits of an approach are in which our society and economy are compared to living networks. Such an approach binds us to a ‘biological reading’ of modern society that emphasizes naturalization, which is only one

element of the ‘moralization of the markets’. In order to understand the transition to the complementary phase, we need to understand the fact that in the competitive stage competition is viewed as a natural structure of the economy, as something ‘objective’, existing beyond or besides ethics, whereas the complementary phase is viewed in terms of cooperation, which implies a convergence of natural and moral developments. We will first explore to what extent it is possible to apply the systems theory idea of a living network to societies (1). We will then explain what it means to say that our economic system embodies a competitive stage of development (2) and which elements make it possible to understand our current time as a transition to a complementary phase (3). In the concluding section we shall briefly discuss the systemic networks paradigm which limits us to an understanding of the ‘naturalization of the market’. We shall integrate this paradigm into a more general concept of system theory enabling us to understand the more fundamental change – suggested by Hegel – of a ‘moralization of the market’. This would also encompass what we have called the ‘humanization of the economy’ (4).

2 SOCIETY, A LIVING SYSTEM

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A systemic, and more specifically, a ‘holistic complexity’ approach makes it possible to compare society with a living being. But in order to do this we first have to describe living systems from a ‘holistic complexity’ perspective. We will see how living networks create sustainable organizations. Only then it will be possible to apply the living network model to societies and especially to economics. This will also clarify what exactly it means to speak about a sustainable society.

When focusing on living networks from a ‘holistic complexity’ perspective we conceive living beings both as organizational patterns and as configurations of relationships to their environment. We do not only focus on what living beings are, but also on how they are. This means that we not only describe stable patterns, but also dynamic relationships or interactive structures. Understanding life from a ‘holistic complexity’ perspective requires addressing the connection with thermodynamics (RIFKIN, 2009, 27). According to Albert Einstein the laws of nature most likely to withstand the test of time are the first and second laws of thermodynamics. These laws are involved in the most basic structures of life. The first law of thermodynamics refers to the conservation of energy in the universe. It implies that the total energy content of the universe is constant. Energy can neither be created nor destroyed. The second law of thermodynamics states that whenever energy is transformed, some amount of

that energy is no longer available afterwards. There is a degradation of potential energy from available to unavailable. This energy, of course, is not destroyed (first law), but it is dispersed in an irreversible process, and ends up going in different directions. Rudolf Clausius called this phenomenon ‘entropy’. This unilineal process inevitably leads to a state of thermodynamic equilibrium in which there is no potential energy left to perform any further transformations. In time, all potential, useful and concentrated energy will inevitably be dispersed into unusable and disorganized forms. Although everything in the universe eventually moves from concentrated to dispersed, and from ordered to disordered, there are forces withstanding this linearity, one of which is life. We can define life as a natural pattern that (temporarily and locally) resists entropy. In terms of thermodynamics, life is a non-equilibrium network. Although this seems to contradict the second law of thermodynamics Ludwig von Bertalanffy has shown in his famous General Systems Theory (1968) that living organisms need to feed on a continual flux of energy and matter in order to withstand entropy. Living beings cannot be described as closed systems, since closed systems necessarily move towards a thermodynamic equilibrium. Bertalanffy therefore defines living beings as open systems which maintain themselves in a non-equilibrium steady state. These open systems constitute, he says, a temporary break of the second law of thermodynamics. In his famous article ‘What is Life’ (1944) Erwin Schrödinger states that if an open system is capable of keeping its internal entropy low, this is at the expense of increasing the entropy of the surroundings (24). Such a description of living systems resolves the apparent contradiction between the laws of thermodynamics and the possibility of increased complexity in the universe.

But of course, these laws cannot explain how living structures could arise in the first place. Ilya Prigogine (2008) tried to describe how open systems could emerge inside closed systems; how steady state structures could arise without thermodynamic equilibrium. To him open systems are ‘dissipative structures’ using energy from the environment to decrease internal entropy. He describes the emergence of stability in dissipative structures as a process of self-organization – a term coined by William Ross Ashby in 1947. This process is the spontaneous creation of a higher level pattern out of lower local interactions (HEYLIGHEN, 2001). Entropy can be seen as a form of dissipation of energy, which in classical thermodynamics is always associated with waste, that to open systems can be a source of energy to build organized structures without equilibrium with the surroundings (CAPRA, 1996, p. 89). Dissipative structures thus not only maintain themselves in a stable state, they can also increase their complexity as a response to an increasing flow of energy. Prigogine also emphasizes that the general patterns of dissipative structures cannot be derived from the parts. These forms of

organization emerge spontaneously at the supra-molecular level. According to François Roddier (2012), we should in fact speak of a third law of thermodynamics based on these insights of Prigogine. From the beginning the universe evolves by creating more and more complex structures capable of dissipating energy in an increasingly efficient way. Generally, structures dissipating energy more efficiently (and producing more entropy) have a higher internal order, which makes them more likely to subsist than less ordered structures. This does not mean that maximizing entropy production always leads to an increase of stability. Whenever a system requires more energy than its environment can offer – or produces more entropy than its environment can assimilate – the system collapses into a state with reduced entropy production. Arto Annala and Stanley Salthe indeed argue that the principle of increasing entropy, when given as an equation of motion, reveals that expansion, proliferation, differentiation, diversification, and catalysis only leads to a stationary state if there is an entropy- absorbing capacity of the surroundings (ANNILA & SALTHER, 2010).

Capra has shown that such a description of living systems in mere terms of thermodynamics is insufficient, because it says nothing about how living systems reduce their own internal entropy. To understand this ability to reduce entropy, we need to look at the internal organizational pattern and process of living systems (CAPRA, 1996, p. 156). This organizational pattern is the autopoietic metabolism that constitutes the essence of life. It is a specific form of organization or configuration of relationships between components (1996, p. 154). Living systems are connections of interdependent components (a cell consists of organelles and a multicellular organism of organs):

“Whenever we look at life, we look at networks” (82). What makes these networks unique is what Humberto Maturana and Francisco Varela called their autopoietic nature. Autopoiesis (self-making) is an organizational structure in which each component participates in the production or transformation of the other components in the network. Living systems are capable of maintaining their energy by internal regulation and cooperation of the parts (Maturana & Varela, 1980, 9). An autopoietic network is always an open system that requires a continual flow of energy and matter. But it is also in a certain way closed, because it is self-organizing and self-producing: “It is continually regenerating its own productive organization” (CAPRA, 1996, p. 163). A ‘healthy’ system is a system of unaltered autopoiesis. When the rate of entropic decay becomes faster than the autopoietic regeneration, a system falls apart. It is then visibly taken into the never ending flow of the second law of thermodynamics.

To understand life, this general autopoietic pattern must be complemented by a process of interaction, a general capacity of responsivity. Living systems have an active interaction with

the environment. They all possess a more or less complex responsive capacity. This interaction also makes adaptation possible. The continual structural changes within the organism (metabolism) are sensitive to external disturbances.

Maturana and Varela call this responsive connection of the internal structure of a living system with its external environment a ‘structural coupling’ (MATURANA & VARELA, 1987, p. 75). This responsive capacity is a crucial element for the evolution of living systems. It made, for example, the neural network possible which has increased the responsive capacity of animals. An autopoietic metabolism needs a relatively stable internal and external environment. The specific homeostatic range in which metabolic reactions can occur is very narrow – think about temperature, oxygen and acidity levels – and overthrowing this range leads to a decay of autopoietic connectivity. This homeostatic process plays a key role in the responsive capacity of an organism. Antonio Damasio has emphasized that the homeostatic range provides the organism with a ‘biological value-system’ which can evaluate external disturbances and generate internal responses (2010, 33-62). Responsivity and first forms of communication with the environment are based on a value system and a kind of cognitive judgement necessary for learning. Valuating and cognition go hand in hand.

These features raise questions about the extension of the concept of life. According to James Lovelock, if we stick to these systemic features the whole earth could be taken as a living being. He calls this living earth Gaia – after the Greek Earth goddess. Lovelock takes this name as a metaphor – as there is no real goddess – but the use of this name is an acknowledgement that the earth is a biospherical network regulating its own internal environment. The earth, as a living planet, is an autopoietic system creating the physical conditions for the existence of large responsivity networks. The Gaia theory turns the methodological macroscope into an interconnected real world in which the biosphere, atmosphere, oceans and the soil are one single operating system that creates the conditions for responsive interactions. So, life can also be seen as a property of planets. Just by looking at the persistent state of disequilibrium among the atmospheric gases, one can gain important indications of life’s activity (LOVELOCK, 1979, p. 6). A living planet will tend to establish a stable energy and a material cycle consisting of minerals (the building blocks), primary producers (plants), consumers (herbivores and carnivores) and decomposers (fungi and bacteria). As in all systemic processes the relational network of the whole consists of feedback loops, contributing to the relative stability required for life (LOVELOCK, 2006, p. 34-49). Important neo-Darwinian biologists opposed this view, saying that such collaboration of organisms is at odds with the notion of selfish genes (DAWKINS, 1982, p. 237), but Lovelock and Andrew Watson (1983) showed with their

computer simulation ‘Daisy-World’ that the notion of selfish units was compatible with the holistic notion of self-organizing systems. The idea of a ‘holistic Darwinism’ is in fact a new paradigm, incorporating Neo-Darwinism and taking systemic ‘wholes’ to be the guiding paths of evolution (Corning, 2005). In this holistic perspective, evolution is seen as a dynamic, multilevel process in which there is both ‘upward causation’ (from the genes to the phenotype and even higher levels) and ‘downward causation’ (environmental and phenotypic influences on epigenetic and genetic processes). Peter Corning also speaks of a specific intersubjective causation proper to life’s responsivity: ‘horizontal causation’ (2005, p. 2).

Alexei Kurakin (2007) has suggested that the development pattern of living networks moves from a competitive phase to a complementary one. The ‘holistic complexity’ perspective describes evolution as a path designed by the self-organizing activity of wholes – and it incorporates in this way the Darwinian view of natural selection. If we start from single organisms we observe a tendency towards higher complexity. Self-organization, being a spontaneous creation of coherent patterns of interactions, tends towards a continual use of energy flowing through the system (HEYLIGHEN, 2001). If this flow increases, the living system reorganizes itself towards higher complexity which permits an increase of connections between the parts and subsequently an increase also of task divisions and specializations, generating more feedback loops throughout the system which in turn augment its responsive capacity. This cycle starts with a positive feedback loop that takes up all new energy creating structural changes like specializations which in turn amplify other structural changes. But this growth is relative to the energy input. The feedback cycle functions as long as there is enough energy supporting it. The system will move towards a steady state pattern. If energy flows shrink, then a negative feedback loop reorganizes the system towards a lower state of complexity (HEYLIGHEN, 2001). Kurakin suggested that there are scale-invariant developmental phases of self-organizing living networks. Eugene Odum (1969) had already recognized recurrent patterns of competition and complementarity in the development of ecosystems. He showed that a first innovation makes the diversification of species possible (ODUM, 2007, p. 46). The different varieties of plants and animals compete for the available energy, the best adapted then being selected by natural selection (KURAKIN, 2007, p. 13). If the amount of energy continues to support the accelerating growth of a species, those maximizing energy consumption will outgrow the others. In this phase the paradigm of natural selection needs no extension. The competitive structure tends to an exponential growth of energy consumption, which, of course, cannot continue forever because the resources are finite. In a situation of limited resources it becomes obvious that it is not true that the fastest growing

organisms always outgrow others. In such situations natural selection is based on the efficiency of energy usage and the capacity of organisms to function in complementary networks.

Development has now moved towards the complementary phase because natural selection is based on energy efficiency which is again based on the capacity of individuals to complement other living beings of the network. The ability to reduce the collective entropy production of a network is the hidden selection principle that becomes visible when energy resources are limited. An efficient reuse of energy and matter by a certain network creates an evolutionarily stable situation for that network and the whole cycle of producers, consumers and decomposers belonging to the network. This complementary phase is not dominated by diversification, competition and material growth, but by specialization, cooperation and synergy. Specialization only makes sense if it fits into a larger cooperative whole. According to Kurakin, the competition stage can be characterized by growth (of both organisms and networks), whereas the complementary phase is characterized by a relative steady-state situation: “Where the competition phase creates and improves parts, the complementary phase creates sustainable wholes” (KURAKIN, 2007, p. 28). So for example, in the competitive stage the number of herbivores increases because there are plenty of plants available and this causes an increase in the number of carnivores. In the complementary stage, however, the components complement and stabilize each other. Competition is still very important but it is only rewarded if it contributes to the maintenance of the whole.

Competition is here only of subordinated significance for natural selection, complementarity being the dominant value. This view of evolution makes it possible to see networks as higher order individuals. According to Capra: “Many species have formed such tightly knit communities that the whole system resembles a large, multi-creatured organism” (1996, p. 34). According to this ‘holistic complexity’ approach, it is not species that are the basic units of natural selection, but eco-systems.

But to Kurakin, evolution theory is just one example of a larger theory of development. The self-organizing patterns described above are universal and taking place simultaneously on different spatiotemporal scales – from biomolecules to cells, and organisms to ecosystems. This pattern is based on an interdependent, hierarchical, co-evolving set of complex networks of both energy and responsivity (KURAKIN, 2007). The higher order system is the boundary of the lower order systems and sets the criteria for successful complementarity. The entire process can be pictured as a spiral of widening concentric circles. Such a logic, based on a concentrically ordered totality of circles, very much resembles Hegelian dialectics. According to Hegel, the system of knowledge is as a circle of circles (‘Kreis von Kreisen’) – each circle pushed forward

by an inner struggle that tends towards a synthesis (1968b, p. 60). Kurakin's idea, however, is just a model of physical structures and is fully based on a naturalistic restriction – also his lectures on mind and intelligence start from a physical model..To Hegel the model of concentric circles is not primarily a physical structure but the basic structure of reason itself, of which the world is a manifestation. According to Kurakin, the engine of development is not dialectics, but mathematics, especially fractal organization. Life is a fractal expansion of self-similar patterns, and this development can be observed on different scales in living nature, from the formation of proteins to the creation of organisms and ecosystems, all being parts of the planetary (Gaia) level (KURAKIN, 2011).

Since Plato's description of the state as a political body there have been recurrent analogies between biology and society. Following the logic of Kurakin we could conceive human society, like every other animal society, as belonging to the web of life. Human society is just a part of the overarching planetary network. According to Edward Wilson, the superorganism metaphor was an important theme in biological literature during the first half of the 20th century (1971, p. 317). The holistic perspective has made a revival possible, and in this paper we have seen several theoretical notions of 'superorganisms', such as Lovelock's Gaia, Corning's holistic evolution and Kurakin's fractal systems.

Mainstream social and economic theory mainly considers human society to be decoupled from the natural order. Classical economic theory deals with self-interested, rational actors. This approach fully separates economics from biology and ecology, and places it on the level of psychology and sociology. According to Robert Ayres (2002), there are a couple of important differences between human economy and the biological world, which always pop up. Properly speaking, in the biosphere there are no – technically and intentionally created – products. There also is no market, money nor paid labor in nature, and there are certainly no intentional or volitional exchanges in the biological world. These differences are, of course, undeniable, but this does not mean that it is impossible to take society, and especially the economy, as being part of a thermodynamic whole. As suggested by Rosnay, we definitively can take human society to be part of a larger network. This is in fact the position of all current ecologically inspired economics, which still has not been largely integrated into mainstream economics. The field of ecological economics, with authors like Alfred Lotka, Frederick Soddy, Nicholas Georgescu-Roegen, Robert Constanza, Howard Odum and Herman Daly, has been working on an economic theory based on thermodynamics. It has therefore emphasized that the growth model is flawed. The defining systemic characteristics of living networks (open dissipative structures, autopoietic metabolism and responsive capacity) can all be used to define

human economics. Important aspects of the market system are analogous to the metabolic structure of living networks. First of all, a continual flux of energy and matter through the system is required in order to keep the dynamics of the system going. Rifkin sees societies as energy flows since they are made to serve the fundamental need of life: subsistence (2009, p. 29). In *The Entropy Law and The Economic Process* Georgescu-Roegen argues that the economic process is just a transformation process of high into low entropy (1971, p. 18). The economy is basically an energy transfer of raw materials into artificial products or services fit for human purposes. This is what we call ‘use value’. The process of production and consumption within the economic system is, according to Daly, comparable to the anabolic and catabolic properties of cells (1968, p. 395). Human labor, he says, is a kind of anabolic production process. Odum even suggests that the phenomena of volitional exchange and the use of money can be compared to the metabolic flows of energy and matter inside an organism (2007, p. 253). These analogies of course have their limitations since they cannot produce anything similar to rational evaluations and autonomous decision making, which are fundamental to the understanding of exchange value. According to Damasio (2010), even autonomous decision making cannot be fully decoupled from metabolic processes and homeostatic regulations. But this does not mean that we can reduce human autonomy to a mere biological value. The scope of all these analogies, however, clearly shows that human economics is much more integrated in life cycles than mainstream economic theory – that merely focuses on rational and autonomous behavior – likes to admit. Damasio’s concept of socio-cultural homeostasis (2010, p. 33-66) suggests that cultural rules, laws and morals – in fact all overarching narratives of a society – serve to maintain a certain type of economic process. The capacity of humans to create external order – think of houses, roadways, factories, businesses and agriculture – does not make society or economy less dependent from nature. On the contrary, it means that economics, biology and ecology are fully intertwined.

We may say that the overarching complexities of self-organizing systems also apply to human societies. This suggestion was made by Herman Daly in 1968 and has been restated by KurakIN: “The fields of non-equilibrium thermodynamics, biology and economics, which appeared to be three disparate sciences, look like descriptions of one and the same phenomenon” (2009, p. 23). This suggests that even though economics deals with autonomous, rational, and intentional human beings, its organizational and developmental patterns seem to express systemic principles. Whenever there is a continual increase of energy flow the complex system reorganizes itself, thus creating more connections between its parts, multiplying task divisions and specializations, and corresponding feedback loops. This assumption is common

to the ecological economics developed by authors like Yaneer Bar-Yam (1997), Odum (2007), David Christian (2011) and Rifkin (2009, 2011, 2014). A central point in the work of the last author is that important economic transitions only take place when new energy resources converge with new forms of communication or transport (2009, p. 37). This leads to a paradigm shift that changes the spatiotemporal orientation of humans, connecting people and markets in diverse ways. According to Rifkin, we are now living such a transformation, which will lead to a new form of connectivity that will increase empathy in the world (2011, p. 35). According to Rifkin, the energy-communication matrices of the First and Second Industrial Revolution drastically increased the amount of manageable energy flow. This was followed by an enormous increase in task divisions and specializations, and by much larger communities. The division of labor activities carried out by different groups of people gave rise to an interdependent network of different compartments – a pattern very similar to the functioning of organelles inside the cell.

Kurakin's insight in fractals can also be applied to these descriptions of Rifkin: the organization of societies with continuously growing economies manifest a fractal pattern of increasingly large organizational structures – the organizational society – in which higher scales provide the boundaries for the lower scale requirements. Such patterns of distributed networks representing increasing complexity also show up if we look at modern roadway structures. The complexity and interdependency of these networks tend to increase. This, of course, has cultural consequences: Rifkin suggests that a positive consequence – the extension of empathy – will bring the world together into one large society in which different cultural narratives, values and rules will be brought together: “There seems to be a detectable pattern to human evolution, captured in the spotty but unmistakable transformation of human consciousness and the accompanying extension of the empathic drive to larger fictional families cohering in ever more complex and interdependent communication-energy matrices and economic paradigms” (2014, p. 300).

The ‘holistic complexity’ perspective offers strong arguments for the notion that economy and society should be perceived as a living network. If we look at the development of human society as being part of the earth's metabolism, it seems obvious that the tremendous economic growth during the last centuries was made possible mainly by the extraction of finite fossil fuels. According to Kurakin, this type of growth is common in a phase in which competition is dominant. The question is what the possibilities are to reorganize our societies. This transformation is highly dependent on our ability to overcome competition and to reorganize the economy in terms of complementarity.

3 LIVING IN A COMPETITIVE SOCIETY

The main issue that characterizes the competition phase of living networks is maximizing energy consumption, which leads to diversification and specialization, and thus to further competition and selection. Maximizing consumption also leads to exponential growth and to a high entropy production or energy decay of the surroundings. Although it is not easy to interpret the whole history of world economy in terms of living networks, at least the capitalist market economy seems to fit quite well into the competitive phase. The engine of the capitalist economy is certainly competition, but over the years this system has developed an organizational structure that functions pretty much like a complementary system of elements reinforcing and supporting each other. According to Eric Beinhocker (2007), economists like Léon Walras, William Stanley Jevons and Vilfredo Pareto attempted to describe the economy as a closed system comparable to the motion of the planets. Impressed by the progress of mathematical physics (Newton) the Marginalists imagined a closed economic system that could fit into their mathematical framework. In particular, Walras saw parallels between balancing points in the economy – such as demand and supply – and equilibrium points within nature (BEINHOCKER, 2007, p. 21-75). The systemic model used was completely based on the idea of thermodynamically closed systems. However, this perspective, according to Beinhocker, is misleading, even for well-structured modern organizational societies, because it overlooks the fact that the economy is an open (living) system affecting its surroundings and having a major environmental impact. An impact that seems to be increasing regardless of the development of strong complementary organizational structures.

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Adam Smith took the economy to be a closed system propelled by a morality of competitiveness. Smith's theory is based on notions that characterize the competitive stage of living networks. Economic wealth, according to Smith, is created when raw materials taken from the environment are used by labor to satisfy human desires. If this conversion of natural capital into man-made capital is what creates wealth, then an increase of wealth will be attained by converting more natural capital through labor productivity into man-made capital. In order to increase this productivity, specialization of labor is necessary (1776). This dynamics of specialization leads to an increased interdependency (complementarity) within the economy, which stimulates trading. In such a system each individual can satisfy their specific needs and wants by pursuing their own self-interest and by maximizing profit in a rationally calculated way. Using resources in the most efficient way certainly helps to maximize wealth, but, since

the objective is to maximize wealth, this implies that there are no limits to the conversion of natural capital into man-made capital. Although man has a natural competitiveness, the economic system should nevertheless be designed in such a way as to further enforce these competitive qualities, thus creating a market based on competition. This then constitutes the basis for a free pricing-mechanism guaranteeing that the best possible good is created for the lowest possible price. According to Smith, this system is able to create a ‘market equilibrium’ between supply and demand, preventing shortages and surpluses. The optimal price of a commodity is the expression of such an equilibrium between supply and demand. Besides this, in Smith’s theory there is also an equilibrium between self-interestness and the general interest which is made possible over time by the ‘invisible hand’ of the market. The systemic consequences of an expanding economy for the environment are not part of his theory. This short summary of the economic theory of Smith shows that the economy is conceived as a closed system that focuses on exchange and trading, and that is triggered and maintained by competition. Market equilibrium is ultimately based on a morality and politics of competition.

This market equilibrium is, however, dynamic in the sense that it is based on expansion and growth. This can best be pictured if we take one of the main elements of the complementary organizational structure of modern capitalism. The banking system is the axis of the monetary system and due to the financial crisis it has now been severely criticized by many authors (FELBER, 2014; TOXOPEUS & ARKEL, 2014; SCHARMER & KAUFER, 2013; ROBERTSON, 2012; HEINBERG, 2011; LIETAER E.A., 2010; EISENSTEIN, 2009; ODUM, 2007). The fractional reserve policy of banks can best be clarified by looking at the origin of the banking system. People deposited their money (gold) at the bank to keep it safe. The receipts they received in return functioned as paper money. Since it did not occur to everybody simultaneously to reclaim their deposits, the bank was able to lend more receipts than the actual amount of gold it possessed. This is where the name ‘fractional’ reserve comes from. Borrowers would then repay the bank with an interest.

In fact this is still standard practice. This type of money creation is also called ‘fiat currency’ – referring to the fiat lux, the creation of light by God out of nothing (LIETAER *et al*, 2012, p. 26). This practice, of course, has a major impact on the economy if applied on a large scale. An important consequence is, for example, debt creation (2012, p. 159-160). Interest charges create a situation in which the total sum of debts is higher than the existing money. This shortage stimulates competition among economic instances (people, companies), stimulating specialization and complementarity in the system. Of course, more generally it also

causes accelerating economic growth. From a systemic point of view the monetary system creates a self-inflating closed system (DALY, 1993, p. 814).

The inflation of the economic system is a form of imperialism that tends to encompass the entire ecosphere by incessantly transforming natural capital into products or services (DALY, 2014). As Odum puts it, the ‘free’ economy of capitalism is in fact a mechanism for overgrowth (2007, p. 263). This imperialism is intrinsically linked to the idea that the economy is a closed system – and that economics is a closed science. This perspective makes it possible for economists to only consider what is ‘economically relevant’ (raw materials, money exchange, man-made capital, in fact everything that can be priced and bought). To consider the economy as a closed system excludes important elements of interdependence, such as ethics, rights, (non-financial) social relations, cultural beliefs and, of course, the environment. However, these interdependencies really exist: people have social feelings, they have notions of right and wrong, and there is a natural environment. These systems are able to hit back. The production of high entropy waste beyond the regenerative capacity of the environment can destroy the very basis on which the economy depends (HEINBERG, 2011, p. 15). As Daly puts it, the economic machine that followed the Smithian design did not lead to major problems within an ‘empty world’ context – empty of man-made capital and full of natural capital (2005, p. 100). But it does lead to problems in a ‘full world’ context – full of man-made capital and relatively empty of natural capital. In fact what we have now is a new form of scarcity that also increasingly obscures the achieved organizational, internal complementarity of modern societies. This outcome is a consequence of the inner machinery of the economic system, which is ultimately based on a morality of competition, rather than of collaboration, and therefore it ends up being blind to its own destructiveness because it assumes that the engine of competition has (closed system) machine-like consequences which is not the case. In order to enter the phase of complementarity it seems necessary to change the moral substance that constitutes the engine of the economy. A system based on a morality focused on collaboration would view the economy as an open system, aware of and communicating with its surroundings, and would also be much more sensitive to the damages that the system inflicts on the environment.

The disruptions of an economy that still functions as a closed machine are manifold. First of all, there can be a disruption of the umbilical connection with nature that secures the flow of energy. The main questions are then: ‘Is the economy too big relative to its environment; are the consuming and waste production rates too fast, is it endangering the food chain on which it depends for its survival?’ (ORREL, 2012, p. 214-215). The economy has to strive towards a higher form of equilibrium in which there is an optimal scale in the relation between economy

and environment. As Daly remarks, such an optimum is still not our general aim. The idea of an optimal scale functions in microeconomics, but it seems to be absent within macroeconomics (DALY, 2005, p. 101- 107). Growth beyond this optimum endangers the basis of the whole system and it leads to progressive disruption of complementary structures of society. If these structures collapse, the system as a whole loses its vitality and capacity of reproduction. This in turn leads to social exclusions and to resistance of the excluded.

Connected to this, a second disruption concerns the disconnect between self-interest and common interest. The promise that the pursuit of self-interest also leads to a common interest is not convincing anymore. Within a full-world context the common interest includes the quality of the biosphere, which is in fact collectively being depleted. Garrett Hardin's paper 'The Tragedy of the Commons' (1968) describes a situation in which individuals behave contrary to the group's long-term best interest by depleting their common resources. As Hardin proposes, only strong regulation can counter this tendency. The idea of an economy autonomously leading to the general interest breaks down. The interdependency of the economy from an explicit will to construct the common good, which situates the economy alongside other normative imperatives related to the social, the environmental and the moral system, becomes a major concern.

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A third disruption concerns the idea of wealth. Within the context of an empty-world, shortages could be met by increasing productivity. But, in a full-world context shortages are caused by depleted resources. Wealth cannot be defined anymore by productivity growth – as is still the case with the 'Gross Domestic Product' measurement. Wealth must be defined as a satisfaction based on material sufficiency (SCHNEIDER, 2014) and cultural and spiritual richness (HÖSLE, 1994).

A fourth disruption concerns the disconnect between economic and lifeworld values (Habermas, 1981). Traditional economics conceives trade as a win-win situation satisfying the self-interested shareholders. Money becomes the most important value indicator (MCMURTRY, 2013, p. 1-21). But money is based on 'wants' or 'preferences', rather than on 'needs'. Money has become an indicator of 'economic demand'. Primary needs, however, are lifeworld values based on our biological, social and intellectual (or spiritual) nature – basic values are correspondingly: nutrition, shelter, health care, freedom, education, communication, responsibility, self-formation, participation (SUÁREZ MÜLLER, 2009, p. 50). Money value on the contrary is a value that can mean anything, it can meet any 'preference'. The basic lifeworld values in the monetary context become just a set of values among others (all possible gratuity preferences). Money in fact becomes a value in itself, since it can indicate everything.

Today 98% of the four trillion dollars spent daily within international trade are purely speculative and disconnected from the lifeworld (LIETAER *et al*, 2012, p. 75). This gives an impression of the disconnect between money value and lifeworld value. A reconnection with lifeworld values would, however, imply that money does not stand for any ‘want’ (demand) anymore, but is intrinsically connected to basic ethical values of human life. The ancient criticism of chrematistics, that we know from Plato and Aristotle, then becomes again an important issue: the economy cannot be centered on the value of money as the general indicator of every possible ‘preference’, but must become the expression of a lifeworld value serving the common good.

A final disruption concerns the disconnect between monetary production and sovereign control. The money creation of the banking system served its purpose in traditional economies, within an empty-world context, but it causes damage today, and the most important damage is an incessant contribution to the inflation of the economy. It also causes social problems, like the devaluation of social, ethical and cultural ‘capital’ by relentlessly encouraging economic competition and utility. Debt contributes to an uneven distribution of wealth. Interest charges augment the capital of the wealthy in a non-meritocratic way, which leads to an increasing and destabilizing divide in society (DYSON, JACKSON & HODGSON, 2014; PIKETTY, 2014; TOXOPEUS & ARKEL, 2014; LIETAER E.A., 2012; EISENSTEIN, 2009). Money created by the banking system in fact endangers the glue, based on trust and cooperation that keeps society together (LIETAER *et al*, 2012, p. 157). Fractional policy creates a situation of expanding debt and of stronger competition between economic members, which also creates a feeling of relentless stress in a continuously accelerating society (ROSA, 2005). So, perceived from a ‘holistic complexity’ perspective, economic actors (people, businesses) turn into a mode of self-preservation that hardly leaves any room for the public interest and the common good.

4 LIVING COMPLEMENTARITY

We have seen that modern capitalism leads to structures of complementarity because it follows a systemic logic, but that this logic is still based on the machinery idea of a closed system that is highly autonomous from neighboring systems. It constructs, so to speak, a complementarity in foro interno and abstracts from the limitations of the external world. We want now to draw the picture of a complementarity that is not merely internal. We have therefore also to consider here which systemic shifts bring this complementarity forward.

Kenneth Boulding once said that “anyone who believes exponential growth can go on forever in a finite world is either a madman or an economist” (1973, p. 248). An economy truly moving towards the complementary phase needs to progressively abandon the idea of economic material growth – there may be still growth in other senses, ethical or cultural growth (Hösle, 1994), but not material growth. As long as energy coming into the system is not limited, those living networks which use that energy before others will outgrow all the others. This creates an exponential growth curve. The complementary phase, however, takes finitude seriously: there is no infinite resource out there. Of course, there is renewable energy, but material products are not just the energy required to make them. And these materials are finite. Similarly, the waste absorption capacity of the earth is finite.

In the complementary phase the economy has to create a steady state of high complexity, such that the economy is not autonomous, but highly dependent on the social, cultural, environmental and moral systems. The subsequent complementary phase is therefore about optimizing a relatively stable configuration that is capable of using the available energy in order to maintain its level of complexity. This level of complexity can only be maintained by a production system that keeps the internal entropy as reduced as possible, and at the same time satisfies material sufficiency and contributes to ethical, cultural and spiritual growth – this is what we call ‘humanizing the economy’. Contributing to the environmental stability – growth is not intended here – is what we call ‘naturalizing the economy’ (the first step here is to take the economy as an open living entity). Naturalization works towards an optimal state between producers, consumers and decomposers. To reach and maintain this steady state, the rules of the economic game must be changed. The guiding economic law should no longer be the law of ‘maximized growth efficiency’, but the law of ‘maximized maintenance efficiency’, which refers to all efforts to improve the stability of energy use and to reduce material consumption. In this system monetary growth must necessarily be invested in environmental and nonmaterial (social, ethical, cultural) goods. This kind of growth contributes to both the naturalization and the humanization of the economy. Competitiveness can still subsist, but it will be aimed, as said, at contributing to the growth of nonmaterial and environmental goods.

Competitiveness will not be part of a logic of conquest anymore but will be part of a logic of cooperation oriented towards the common good – ‘common’ meaning not just a ‘human common’ (of nonmaterial transcendental goods), but also a ‘cosmic common’ (including environmental goods).

We now want to go through some shifts that seem necessary to arrive at a truly complementary stage. It consists on the one hand of shifting the perspective of human nature

from the idea of the ‘homo economicus’ towards that of, as Rifkin puts it, the ‘homo empathicus’. But it also consists in many other shifts such as: from a monetary based economy towards a human-needs economy, from a linear chain production towards a circular production, or from a scarcity based market situation towards a collaborative product-use economy. Also, the measurement of success will have to shift from the current simple financial growth measurement towards a qualitative balancing system. A shift will be necessary from our current system, based on a combination of heritage and meritocracy, towards a system based on a combination of a basic income, restraint heritages and meritocracy. All these shifts are highly intertwined and reforming these issues separately would prove both difficult and insufficient. What is needed, is a systemic change in which society shifts in its totality. However, changing things all at once is impossible, so it is necessary to consider where to start.

The first thing to do is to change the organizational orientation of institutions and enterprises. Since modern society has already developed into an organizational and democratic society (in which the public domain is the ‘self-reflective spirit’ of our total actions) we think that changes have to hit at the heart of organizations and that is their ‘system of accountability’. This system is now fully financial, based on the transparency of monetary flows (bookkeeping accountancy) but this system should be transformed into a system that – inspired by Hans Jonas (1979) – could be called a ‘system of responsibility’. As a first step it is therefore crucial to involve organizations in a measurement of their own contribution to the nonmaterial and environmental common good. This first change encompasses major changes in economic anthropology, which has to shift from the model of the ‘homo economicus’ to that of the ‘homo empathicus’. This does not imply any naive idealization of man, nor does it mean that we abstract from the fact that man can be pretty nasty and egoistic – society will always need institutions to protect humans from themselves. It means instead, that on the level of organizational structures the ‘ideal figure’ (Idealbild) that organizations should be structured upon is a non-egoistic, altruistic individual that is highly sensitive to the common good. What really moves the hearts of people is something we will never know but people can repeatedly give ‘proofs of empathy’, which can be signaled and measured– whether they are actively purifying or merely green-washing their soul or image is not of our concern. The ideal of a ‘homo empathicus’ is, however, not just a social construct.

The idea that human beings are isolated, narrowly self-interested individuals with insatiable ‘desires’ and whose happiness depends on the accumulation of material goods, does not render the full scope of what it means to be human. Even though ‘greed’, ‘insatiability’ and ‘competitiveness’ are properties of humans that does not render the full image of what we are;

vices are not the primary or primitive incentives. Love and cooperation have largely contributed to man's success and although it is true that virtuous actions do not guarantee a positive outcome, and that bad intentions can (as Bernard Mandeville, 1723, has shown), it is obvious that society is largely dependent on cooperation, group solidarity and social cohesion.

The anthropological story that grounds economic theory cannot be based on the picture of a self-interested actor. As neuroscientist Tania Singer suggests, self-interest is not the only nor the principal driver of human behavior (2013). Neuro-scientific research, especially on mirror neurons, has shown that our brain is actually hardwired for affective resonance and empathy (SINGER, 2013; DE WAAL, 2009; IACOBONI, 2008). Instead of acting as isolated individuals we consider ourselves to be socially resonating individuals, open to – and communicating with – other exterior networks. According to Nicholas Christakis and James Fowler (2009), it is this high capacity to resonate, that sheds doubts on the image of an atomistic self-centered individual. Although it is clear that we are monads – since we can never really escape our 'self' – these monads are intersubjectively attracted to each other.

There is in us a kind of longing for a harmony of love, an *ordo amoris*, as Max Scheler (1973) puts it, which exists next to our brutal nature. According to Rifkin, one positive aspect of globalization is to bring people together; modern mobility and new means of communication (the internet) increase empathic feelings as long as they are not perceived as endangering our subsistence. Otto Scharmer calls this a shift from an 'ego-system awareness' to an 'eco-system-awareness', in which caring for the wellbeing of the whole is the major incentive of action (2013).

This new perspective will cause a shift from money defined value towards human defined value. Neo-classical economic theory – and in fact also traditional liberal economic theory – presuppose that sustainability can be solved by mere price adjustment because scarcities lead to higher prices. Such a way of thinking highly underestimates both the true value of ecosystems and the consequences of environmental destruction. The value of insect pollination alone, mounts up to 217 billion dollars (ORELL, 2012, p. 215). It makes no sense to regulate these problems through price mechanisms. An alternative to this closed system approach is the resource based economy, exemplified by 'The Venus Project' of Jacques Fresco and Roxanne Meadows (2007, p. 21). A resource based economy starts with an evaluation of the amount of resources that could annually be consumed. If people cooperate, it is possible to distribute this quantity equitably so as to eliminate scarcities and provide satisfying standards of living for everyone. Their claim is that the earth is providing enough to generate sufficiency for all of us. This, however, cannot be accomplished within our current monetary system –

money now stands for every desire whatsoever – since it implies restrictions on consumption. If we take for example meat consumption the difficulty becomes obvious. On the one hand we have individual preferences, and on the other hand we have the biophysical limits. ‘Demand’ (preference, desire, want) cannot therefore be the ultimate guiding category of the market economy anymore. It can only function as an economic category if it also has an ethical and environmental content.

Fresco, Peter Diamandis and Steven Kotler (2012) claim that with this shift from a money based economy towards a human needs economy a respectable standard of living for everybody can be achieved even if we place limits on personal preferences. However, in order to create wellbeing for all without destroying the planet we need either to increase our resource productivity by a factor 5, or reduce our resource usage by 80% (SCHARMER & KAUFER, 2013, p. 81). This last option is only possible if we replace the linear production of the old economy for a system of circular production. Our current system is highly inefficient from a resource based perspective. Circular economics integrates the ecological component of the decomposers into the economic model. In order to decrease pressure on natural decomposing systems, we have to create decomposing structures in foro interno. This is known as the cradle to cradle principle, according to which the waste must be recycled as much as possible. Smart circular production lines could decrease resource usage.

Another important shift is to change the position of the consumer. According to Scharmer, the consumer is now positioned at the end of the economic chain because commercials and marketing strategies try to create artificial preferences rather than to meet their real needs. Also according to Scharmer and Kathrin Kaufer, we have to move towards a needs-oriented economy, which means an economy focusing on basic human values (2013, p. 117). We therefore prefer to speak of a lifeworld oriented economy. In our current economy producers come up with products independently of the intervention of customers. In a circular economy customers become ‘prosumers’ and help to co-create products (118). This shift can only succeed if the incentive of personal money-making becomes secondary.

In market capitalism there is a structural incentive to reduce marginal production costs in order to obtain or maintain profit. According to Rifkin (2014), this reveals a deeply inherent paradox of our market capitalism. When marginal costs approach zero, abundance could be created, making the commodity essentially free. The paradox within market capitalism concerns the fact that this inherent tendency towards zero marginal production costs contradicts the core dynamic of capitalism which is oriented towards profit. According to Rifkin, due to technological innovations zero marginal cost consumption can become real if we restructure

our economy in such a way that consumers become ‘prosumers’ – think of the consumer as a power plant owner. Self-produced commodities will never become fully free, but their costs will be fairly low, so that this will not give them an exchange value. This self-productivity model is based on an abundance model – commodities, without major exchange value, will be abundantly produced. But, of course, production must be limited by the average optimum usage of resources. As Rob Atkinson (2014) says, if virtually everything is free this would inevitably lead to increased consumption and exhaustion. The idea of an optimum usage of resources restricts abundance, which will only revive exchange value if these resources are not equitably distributed. Sufficiency would in fact be a better word than abundance. According to Rifkin, the new economic platform focused on creating a zero marginal cost production within planetary boundaries is called the ‘The Global

Collaborative Commons’. This commons project is a cooperation platform designed to create a collective utility value. Wikipedia serves as an example, it is the result of over 19 million voluntary contributors. The website is free and hardly generates any exchange value, although it has a huge use value. This kind of ‘prosumer’ production and sharing of consumption (collaborative commons) can be extended to several fields, from renewable energy, to 3D-printing, or to the ‘internet of things’. This creates an economic system in which the traditional separation between producers and consumers disappears, creating instead a ‘peer to peer’ network of ‘prosumers’. The optimal efficient state is reached when marginal cost really approaches zero (RIFKIN, 2014, p. 186).

The collaborative commons, as pictured by Rifkin, seems to eliminate every form of meritocracy. Support for such a system comes from the idea of a citizens’ income, since this idea also seems to annihilate meritocracy. One of the causes of the market system’s success has certainly been the idea of remunerating the diligent. From an ecological perspective the meritocratic value, stating that everyone ‘should’ work, is probably causing more harm than good. Keeping everyone employed requires far more energy and materials, than producing the same wealth with less people. The benefit of the meritocratic value system, however, is that it offers a fair allocation system, which seems to be at stake when only a fraction of the population actually work. We have to think about other forms of meritocracy. There is probably no single sector that will not be influenced by the technological innovations of automation. The progress of automation technologies will probably change the whole production system. An Oxford study estimates that in less than twenty years 47% of American and 54% of European jobs are threatened by automation (BREGMAN, 2014, p. 77). The argument that innovations will replace jobs is flawed, since most of these new jobs can be automated as well. The idea that

everybody should contribute to society in a traditional job structure must be abandoned. Citizens' income and job time reduction seem inevitable. Work time reduction, however, is more difficult to realize in certain sectors than in others, and certainly needs better ways of cooperation. According to Rutger Bregman, the 15 hour workweek might solve stress reduction, climate change, unemployment and inequality (2014, p. 41-43). But this can only be put into place if we manage to slow down the economy, which is a key problem in a competitive world. A common ownership of automated production, combined with a citizens' income, could ensure a fair distribution of income. Meritocracy, in the sense of a fair remuneration for the best work, can still function within certain margins of remuneration.

A crucial change is, as we said before, the new measurement of economic success. Today there exists a one-dimensional measurement of quantitative growth of goods and services whatever their (ethical and environmental) quality. We saw this illustrated by the use of Gross Domestic Product as the measurement of national economic success.

The increase in expenditure for cleaning up toxic waste, police protection, the expansion of prisons and medical facilities, military sales, etc., all positively affect the GDP (RIFKIN, 2014, 20; CAPRA, 2009, p. 5). Zero marginal cost phenomena, on the contrary, decrease the GDP. Neither can many qualitative aspects of our lives (health, happiness, leisure, meaningfulness) be measured in GDP. In short, measuring the sum of transactions within an economy does not discriminate between the qualities of the transactions (SCHARMER & KAUFER, 2013, p. 119). This underscores the idea that the capitalistic market economy tends to interpret itself as a closed system that is separated from social, ethical, cultural and environmental values. Capra simply suggests that from now on the terms 'growth' and 'economic success' should only refer to what enhances the quality of life – or, as we say, 'lifeworld' (2009, p. 4-8). Measuring economic success on the basis of lifeworld values – we call this 'humanization of the economy' – and on ecological values – what we called 'naturalization of the economy' – is a major challenge. There already exist many alternative macro-level measurements like the Gross Happiness Index, the Index of Sustainable Economic Welfare, the Genuine Progress Indicator and the Happy Planet Index. The program of measuring ethical values is not an invention of utilitarianism, it was first conceived by Plato, who considered that a mathematical approach of the good could be possible – his lectures on the good, Περὶ τῶγαθοῦ, were largely about mathematics (GAVRAY, 2017, p. 103-133).

5 FINAL REMARKS

Measurement changes, we think, should occur at the heart of the organizations which constitute our society, especially of enterprises. The system of accountability should be transformed, as we have said, into a system of responsibility. The ‘Global Reporting Initiative’ and the ‘Common Good Matrix’, designed by the civil society organization ‘Economy for the Common Good’, already work towards that end. An EU directive has already been set in place to meet this end. The financial balance sheet of companies should be accompanied by an ethical performance report, which can be used to obtain tax reductions or public procurements. Nonmaterial and environmental success would then not only be measured, but also financially remunerated (SUÁREZ MÜLLER; FELBER, 2017b, 2016; FELBER, 2010). Organizational ethical reporting should measure moral, cultural, social and environmental performances, thus doing justice to the double imperative of humanizing and naturalizing the economy. The success of such ethical measurements is essential for a process of transformation of our societies to begin. It will hopefully trigger several of the ideas outlined in the last section, such as the introduction of a citizens’ income, collaborative production (prosumerism), or a basic human needs oriented circular economy. Such forms of ‘ethical accountancy’ must be based on criteria which must be developed by the organizations concerned as well as by think tanks (universities, research institutes, specialists organized in guilds). These criteria should also be ratified democratically. An upgrade of the criteria within a fundamental commitment to core principles (such as the importance of nonmaterial and environmental values) should also be possible. This, ultimately, will probably also change both the banking, and the money and debt creation system. The main challenge is to measure qualities in the light of a unitary system that encompasses all types of organizations.

As we mentioned above, Hegel, now some 200 years ago, described the transition from ‘bourgeois society’ which is propelled by competition and self-interest, towards an ethical ‘civil society’ committed to the common good. He used the same expression, ‘bürgerliche Gesellschaft’, for both situations, thereby implying that there is a natural development from one phase to the other. In ‘civil society’ economic processes cannot be viewed separately from ethical concerns. Hegel conceived the idea of an ‘ethical economy’ in a sense that today we would identify as a society with a major concern for ‘responsibility’ (NESCHEN, 2008, p. 159-219). According to Hegel, such an ethical society (sittliche Gesellschaft) would need some intermediary institutions between the state on the one hand and organizational society on the other. He speaks about two institutions, the ‘police’ (using the word in an earlier sense than

ours) and the corporative system – both institutions would be endorsing and enforcing this responsibility of continuously creating and maintaining an ethical economy. It would take too long to go into details now but the corporative system implies a participation of the existing professions and enterprises, which would send delegates representing them to the corporative institutions (1986a, §231, §250). A system of ‘ethical accountancy’, focused on ‘policing’ responsibility, quite similar to that of today’s financial accountancy could be seen as an intermediary institution between the state and the (profit and not-for-profit) organizations. This ‘policing’ is committed to the reproduction of a steady state situation in which there is a constant amount of material usage. On the material side, the economy would be concerned with producing sufficiency and environmental stability. We called this the ‘naturalization of the economy’. Growth would only be possible on the level of nonmaterial goods which potentiate the social, ethical and cultural dimensions of society. This is what we have called the ‘humanization of the market’. This implies that consumption – the consumer’s ‘preferences’ – should be primarily oriented towards goods expressing basic lifeworld values. Such an ethical consumption would not only be the concern of consumers (who often do not have a free choice and do not know where products come from); the state and the intermediary institutions should be concerned about the ‘demand’ side of the economy too. The moralization of the economy must be developed on both sides, production and consumption.

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It becomes clear from what has been said in the last section and the remarks that followed that the transition from a competitive to a complementary stage cannot only be viewed in terms of a development of living networks. A major change in mentality, specifically in moral consciousness, will trigger the passage to a truly complementary phase of the economy. The development of living networks other than human is never based on moral reflexivity. That is why the biological paradigm used in our ‘holistic complexity’ approach does not cover the transformation that lies ahead of us. It can be used, though, as an analogy that has an element of truth: the economy is really a system limited to the boundaries of the ecosphere. This ecological insight is now part of our moral consciousness. The naturalization of the economy is no fiction, but a moral imperative. This suggests that the systemic approach inspired by thermodynamics (physics) and living networks (biology) needs to be complemented with, and to a certain extent integrated in, a systemic concept that finds inspiration not in physics and biology, but in reason and morality. Some inspiration could be found again in Hegel, according to whom the system of reason is built up as a circle of circles integrating physical, biological, ethical and cultural structures (the so-called ‘spirit’). It would be understandable then that natural and moral developments can converge (ILLIES, 2006). If living beings are complex

structures with a highly developed responsive capacity, as Damasio says, then the transition to a situation in which the ‘homo economicus’ mirrors the ‘homo empathicus’ could be interpreted as a phenomenon of convergence.

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