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Reconsidering critical realism: an environmentalist's perspective

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Abstract: In this paper, I discuss the compatibility of heterodox and ecological economics. Taking critical realism as a unifying ontology for heterodox economics, I argue that there is a radical dissonance between ontological presuppositions of ecological economics and heterodox traditions that adopt critical realist's perspective. The dissonance lies in the need of ecologically oriented economic schools to state strict causal regularities in socio-economic realm, given the environmental intuitions about the nature of economy and the role of materiality and non-human agency in persistence of economic systems. The paper uses conceptual apparatus derived from Andrew Brown's critique of critical realism and Bruno Latour's *Actor-network-theory*.

Keywords: Actor-network-theory, causal regularities, collective events, critical realism, flat ontology

1. Introduction

In November 2013, the UN's climate conference took place in Warsaw, the capital city of Poland. Diplomats from merely every country met here to negotiate about new environmental policies that could face the reality of climate change. At the same time, Typhoon Haiyan (also known as Typhoon Yolanda) made landfall on Philippines – the strongest tropical typhoon

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ever recorded. The country found itself in major humanitarian crisis, with thousands of casualties and devastated civil infrastructure.

What makes this co-occurrence of two events – one obviously political, while another one natural – an interesting case in discussing philosophy of economics? Typhoon Haiyan was recognized as a direct consequence of ongoing global climate change. Claims about connection between human activity and increasing power of super-storms were made by both scientific and political authorities.² In relation to economics, the point is clear: our global economic regime, based on predatory consumption of fossil fuels, which are basically the cornerstone of contemporary industrial activity, can be blamed to be the cause of unprecedented disasters.

The story of climate change is pretty well known. The role of industrial production in this process is the one of a major polluter. What justifies this proposition? It is an observation of the behaviour of Earth's climate system and a transposition of collected knowledge about this object of scientific study into the predictions of future course of events. Once the causal connection between the number of particles of carbon dioxide in an atmosphere and rise of global average temperatures is established, it implies a direct incentive for policy-makers.

Now, the relation is clear, concerning at least economy and economics. But what about the *philosophy* of economics? Here is my proposition: events such as Typhoon Haiyan inform us about certain ontological properties of real-world economies. More specifically, it supports an ontology of economics in which society and nature are not in hierarchical relation, but are parts of the same ontological region. It implies also that the boundaries between nature and society collapse and the framework which this dual category falls into shows up as an inadequate ontological model. In essence, this is a preliminary idea of a picture of reality I would like to follow in this paper.

Take this introduction as a sort of an *intuition pump*. The central focus of this paper lies in a more particular issue. What I will be questioning here is a compatibility of critical realism with ecological economics. My argument will go roughly as follows.

² See e.g. Carrington & Vidal (2013); Carrington & Mason (2013); Nuccitelli (2013). Evidence from climate studies can be found in Francis & Vavrus (2012) and Elsner et al. (2012).

Tony Lawson's social ontology can be understood as an attempt to unify various heterodox schools of economic thought – including ecological economics. Consequently I argue that in case that heterodox economics were really to embrace the critical realism as its own paradigmatic theory, it would be in conflict with central pre-analytic vision of ecological economics, as formulated e.g. in Spash (2012): economy is an inseparable part of the ecosystem in which it is situated (44–45). To me, such a vision has certain ontological consequences that conflict with Lawson's account of social reality and social agency.

Lawson states that in social world, strict causal regularities of the form “When X then Y” are extremely rare (Hirsch & DesRoches 2009, 113–114). However, given the pre-analytic vision of ecological economics, we need to presume that strict event regularities are not so rare in the socio-economic realm. For example, the following statement is a case of proposing a strict regularity: “Intensification of industrial production in Western (post)industrial countries leads to rising levels of CO₂ in atmosphere.” Another example is: “An economy cannot grow indefinitely in a finite world.” In uttering these statements we posit some regularly occurring causal relation between economic activity and natural processes. I analyse these statements as examples of *collective events* as defined in Brown (2007). Such statements are typical for practically all branches of environmental science and if it were true that they cannot be proposed, a huge part of ecological research would lose its relevance. Thus, in ecological economics, we need to presuppose the existence of strict regularities in the realm of socio-economic relationships, contrary to what Lawson proposes.

Moreover, I will go one step further even from Brown's own analysis. That is the notion of social actor, which is in critical realism too narrow to include some key economic actors – notably the non-human parts of the environment in which the economy is situated. For the purpose of addressing this issue, the *Actor-network-theory* (ANT) of Bruno Latour et al. will be used. That will also mean to reconsider our notion of nature of socio-economic reality and the question of elementary parts of an assemblage of social.

Here is an itinerary of the paper. Section 2 will describe Lawson's critique of economic mainstream that is connected with an argument against the existence of strict regularities in socio-economic realm. In Section 3, I will briefly sketch the minimum of ecological economics. The following Section 4 will present Andrew Brown's notion of collective events, which will open up the possibility of proposing strict event regularities in economics anew.

Further discussion of Lawson's as well as Brown's own ontology will take place in Section 5, where the perspective of ANT will be introduced. Concluding Section 6 will point at the modernist notion of science and the blurring boundaries between nature and culture.

2. Critical Realism

The philosophical school of critical realism proposes a social ontology that leaves the methodology of mainstream economics inadequate. Economic mainstream studies the realm of socio-economic relationships by means of formal-deductive method that does not meet the nature of the object of its interest. So why discuss critical realism if its general idea is consonant with ecological economics? I find two main motifs for such a debate:

- 1) Lawson (2006) proposes critical realism as a unifying philosophical paradigm for heterodox economics (484). Besides post-Keynesian, feminist or Marxist economics, the contemporary ecological economics can be equally included under this umbrella term. Critical realism is meant to provide solid ontological and methodological groundings for all these various economic studies. That could be seen as something worth of our interest, for nowadays schools of ecological economics seem to rest in unstructured methodological pluralism, eclectics and overproduction of puzzling and contradictory presuppositions (Spash 2012, 40).
- 2) Critical realism has already been a trending issue also in ecological economics, and in some sciences, such as critical management studies or human geography, it became one of the dominant paradigmatic theories (Hirsch & DesRoches 2009, 103). Hence the critical discussion should add some limits to what extent the critical realism is applicable in ecological economics.

As mentioned before, Lawson in principle criticizes mainstream economics for being ultimately exclusive in relation to any other method than quantitative, formal-deductive method of econometrics.³ He traces this insistence back to the three interconnected propositions mainstream economics rests upon:

³ According to Lawson (2006), this is to be counted as the definition of mainstream economics: "... the mainstream project of modern economics just is an insistence, as a discipline-wide principle, that economic phenomena be investigated using only certain mathematical–deductive forms of reasoning" (492).

- 1) *Event regularities*: Formal-deductive models presuppose the existence of strict causal regularities in social world of the form “If A, then B always follows” (Hirsch & DesRoches 2009, 113).
- 2) *Isolated atoms*: The causal explanations of economic phenomena can be formulated in terms of “isolated atoms”. These isolated events or objects can be represented as *factors* that are elements of the causal nexus (Ibid).
- 3) *System isolation*: „... if the factor is triggered—this triggering is the first event—the *same outcome, the second event, always follows*, so long as nothing interferes. It is the assumption of *system isolation* that guarantees that nothing does interfere“ (Ibid).

These premises imply that econometrics is an ontologically inadequate method for economic science, granted that social reality is to be treated as emergent ontological region, characterised as dynamic, processual, continually reproduced and transformed by social practice, structured, meaningful and valuable (Lawson 2006, 495–496). It follows that „... social reality is found not to comprise parts that are isolated, for more or less *everything seems to be constituted in relation* to other things. And components cannot be treated as atomistic or stable, for *each is being continually transformed*“ (Hirsch & DesRoches 2009, 114). This conclusion is supported by our *a posteriori* observation of recurring failures of successful predictions by mainstream economics.

A system that displays causal regularities needs to be *closed* according to critical realism. It means that it posits both *intrinsic* and *extrinsic* closure:

- 1) Intrinsic closure: “... the given event must always follow from the mechanism x...” (Morgan 2014, 9).
- 2) Extrinsic closure: “... the system must be separated from external influences...” (Ibid).

Such a notion should be better described as a notion of *isolated system* and has one unfortunate consequence, namely that this kind of system can't be studied by external observer, because all causal connections with the environment are broken. I will come back to this feature later. Now, it is important to point at the complementary notion to the concept of isolated system – an *open system*: “An open system is one in which there are many generative mechanisms and thus the continual possibility that similar events are brought about through

different mixes, and where there is also the converse possibility that variations in events may occur because of different mixes” (Morgan 2014, 10–11). Socio-economic realm is a case of an open system and it follows that genuine strict regularities – similar to the iron causal rules of nature – do not occur here.

3. Ecological Economics

As probably in all recently emerged disciplines, the standard definition of what is ecological economics is not yet established. However, we can trace several key features that shape this field of study as a separate scientific discipline. Following some key authors – such as Clive Spash, Inge Røpke or Silvio Funtowicz – the mostly agreed characteristics of ecological economics are these fives:

- 1) *Insistence on ethical dimension* of economic practices (Spash 1999, 413; Spash 2012, 45; Funtowicz & Ravetz 1993, 205).
- 2) *Intertwining natural and social sciences* in order to describe the interconnections between human actions and ecosystem mechanisms (Spash 1999, 424; Røpke 2004, 294).
- 3) *Inspiration from other heterodox traditions* in economics, such as institutional, Marxist or feminist economics (Spash 1999, 413).
- 4) *Strong orientation on policy-making*, which is a consequence of conscious normative groundings of ecological economics (Spash 1999, 425; Spash 2012, 45; Funtowicz & Ravetz 1993, 206).
- 5) *Irreducible value pluralism*, that is essential in grasping the problems of democratic negotiation of environmental policies (Spash 1999, 425).

These characteristics spring from the general intuition of ecological economics, as formulated in Røpke (2004):

“The basic observation in ecological economics is banal and difficult to disagree with: *the human economy is embedded in nature*, and economic processes are also always natural processes in the sense that they can be seen as biological, physical and chemical processes and transformations... The basic

idea of what becomes ecological economics is that the economy ought to be studied also, but not only, as a natural object, and that economic processes should consequently also be conceptualized in terms usually used to describe processes in nature” (294).

Spash (2012) and Johanisová (2014) coined this proposition (italics in quotation above) as a *pre-analytic vision* of ecological economics.

Let me show now how the analytic apparatus of this discipline usually looks like. We can start from the distinction made by Nicolas Georgescu-Roegen between three elements of economy: *stocks*, *funds* and *flows*. Imagine the economy as a giant organism that has certain inputs and certain outputs. In such a system, materials and energy flow through it. The inputs can be sorted into two categories. An input of the first type is a *fund*. The most common fund is solar energy, which is always used only at the particular rate (i.e. it is not a subject of depletion) and as such it cannot be stockpiled without being captured in some specific energy carrier. The second type is a *stock*, which means (besides other characteristics) that it can be stockpiled and once entering the system, it is a subject of various transformations and can be depleted (the *rate* of extraction is not limited by the nature of the resource). Stocks are basically the sources of energy carriers, such as oil, gas or coal. Given these definitions, a *flow* can be understood as a stream of energy carriers through the system.⁴

How the economy in this model looks like? In case of Earth's ecosystem, the primary fund is solar energy (Georgescu-Roegen 1975, 369; Boulding 1966, 5). This energy is used by various strategies, e. g. photosynthesis in case of some living organisms. In limiting cases, it can be trapped for some time. That is a case of fossil fuels, which are virtually the rays of sun caught in the organic material that was accumulated under the surface for hundreds of millions of years (Kerschner 2010, 546). Now, this is the situation when a stock is created. It carries the initial solar energy that can be unleashed by series of activities, such as combustion in our case of oil. Moreover, it can be materially transformed (e.g. oil can be converted into numerous types of plastics).

From this point of view, economy does not seem to be a closed cycle of money and commodities between the sides of supply and demand. Instead, a picture of organic

⁴ According to Daly & Farley (2011, 70–72). See also Scheidel & Sorman (2012, 589–590).

metabolism arises. It is particularly important to stress the fact that ecological economics includes biophysical processes as central to the existence of economy. What we end up with is a picture of economic analysis as analysis of material and energy flows through the system. As the matter of fact, economy is a system of material processes and it ought to be studied in this respect (Georgescu-Roegen 1975, 350).

As we can see, ecological economics balances between natural and social scientific approach. It frequently crosses the borders between realms of physical reality and social constructions, in order to include all objects that count in real-world economy for the purpose of adequate explanation of this structure. It follows that sometimes, ecological economics states propositions claiming strict causal regularities of the form “When X than Y”, as in the case of the platitude that *we cannot grow indefinitely in a finite world*.⁵ Such a general assertion is a hidden declaration of causal relation between growth of economy and the stability/resilience of global ecosystem – the more growth you have, so worse for the ecosystem. Taking ecosystem stability and resilience as central abilities for its defence against disrupting exogenous factors, growth of economy increases stability but lowers the resilience of the system, i.e. it leaves the system vulnerable to exogenous factors and also uncovers structural problems that are in many cases just accidents waiting to happen (Holling 1986, 296–297; 308; 311).

Growth of economy as an imperative of capitalism is intrinsically connected with existence of cheap and accessible energy resources (Hall & Murphy 2011, 52). That brings us back to fossil fuels. Evidence from energy studies, namely in papers concerning Peak-Oil, suggests another causal regularity within current economic system – the predominant depletion of fossil fuels that is a necessary precondition to maintain capitalism, that can easily turn to be its Achilles' heel, as energy efficiency of extraction of resources stagnates (Kerschner et al. 2013, 1424–1425; Kerschner 2015, 131).

4. Collective events

Now, what's the drawback of exorcizing strict regularities from social reality, as critical realism attempts for? In general, the problem is that the assemblage of social sticks together

⁵ See e. g. Boulding (1966)

by practice of actors that are mobilised in the social networks. It is not an abstract structure imposed on material world – social structure is continuously produced, shaped and re-shaped in practices situated in the material world. As Latour (2007) would say, it is not some special *stuff* driven by special *social* forces (1), as ether in Aristotelian universe, which guaranteed the revolution of celestial bodies around the Earth, granted its inherent ability of circular motion.

This ontological vision is justified by Wittgenstein's argument in his late work *On Certainty*, where he discusses the connection between rule and its practice. The point is that – according to Wittgenstein – the way a rule is established is essentially a certain practice that serves afterwards as a paradigm (or precedent) that is to be followed. The practice itself thus shows us the rules to be governed by in reproduction of this practice. That is for example a case of making a judgement: „We use judgments as principles of judgment“ (Wittgenstein 1969, 125). Another case can be calculating: “If you demand a rule from which it follows that there can't have been a miscalculation... the answer is that we did not learn this through a rule, but by learning to calculate. We got to know the nature of calculating by learning to calculate... This is how one calculates. Calculating is *this*. What we learn at school, for example.” (Wittgenstein 1969, 50). So to speak, we cannot distinguish between rule and its application, or in other words between norms and practices.

Some pages later, Wittgenstein adds:

„139. Not only rules, but also examples are needed for establishing a practice. Our rules leave loop-holes open, and the practice has to speak for itself.

140. We do not learn the practice of making empirical judgments by learning rules: we are taught judgments and their connexion with other judgments. A totality of judgments is made plausible to us“ (Wittgenstein 1969, 145).

Justification of following certain rule thus ends up in blind practice, which is a position similar to his discussion of rule-following paradox in *Philosophical Investigations* (Wittgenstein 1997, 85e). To use some sociologic terminology – discursive practices are mounted through non-discursive practices:

“28. What is 'learning a rule'? – *This*. What is 'making a mistake in applying it'? – *This*. And what is pointed to here is something indeterminate.

29: Practice in the use of the rule also shews what is a mistake in its employment” (Wittgenstein 1969, 35).

Wittgenstein's argument is similar to Brown's own position. According to him, social structures, practices and relations cannot be distinguished from each other (Brown 2007, 500; 513–514). As we will see later, this thesis conforms also to an ontological vision formulated by Bruno Latour.

Now, everyone would probably agree that social norms are parts of social system. However, these norms exist only in practice and so the system as such persists as long as an activity of following certain rules occurs. A recurrence of certain practice in predominant population of social actors is thus a necessary condition for persistence of given socio-economic system, or – as Brown (2007) would say – an *organic necessity* of the system (510). To grasp the socio-economic network adequately, we have to give an account of *key causal regularities* that are reproduced in the system.

What are the features of these regularities? To describe them, I will use Andrew Brown's peculiar notion of *collective event*. Brown introduces this concept in his critique of critical realism from the perspective of systematic dialectics. He tries to show that “the contemporary economic system displays many strict event regularities, and is in this sense ‘closed’ *contra* critical realism” (Brown 2007, 501).

The definition of collective event is the following one:

“When taking a system-wide, historical perspective on capitalism, an [collective] ‘event’ is defined over a collection of individuals across the capitalist system... as follows: ‘many individuals go to work for a wage’, ‘many capitalist firms produce in order to make profit’, ‘there is ubiquitous buying and selling of commodities’... Collectively defined events characteristic of capitalism (henceforth termed ‘collective events’), so formulated, could also be termed ‘states of affairs’” (Brown 2007, 508).

It is important to stress that collective events are detectable only at system-wide perspective. Brown acknowledges that from a first person view, critical realist's perspective seems to be correct, because a single man cannot grasp the system at large – in his immediate context, reality can seem to be pretty irregular (Brown 2007, 508). But once we abandon an individual perspective, collective events are traceable in given social system. What are the characteristic features of such events? Here we can list these four:

- 1) Collective events are *empirically unobservable*, i.e. we never see *many* individuals going to work, but always only some small subset of individuals at given spatiotemporal coordinates.
- 2) They typically appear during a longer period of time.
- 3) An utterance of collective event is indicated by operators as “many”, “large”, “predominant” etc.
- 4) The persistence of given socio-economic system presupposes an occurrence of collective events.⁶

For example, to make the capitalist system viable, the transaction of commodities at certain level has to be the case. Another case is the depletion of cheap and accessible energy resources mentioned in Section 3. Certain practices need to be conducted in sufficiently large amount in order to preserve the system. Thus to state that we live in capitalism means to bind oneself to some ontological assumptions – namely that there are regularly occurring events. It means that we propose a *self-reproducing mechanism*, verbalized as an assertion of strict causal regularity of the form “When X then Y”, or to be more concrete, of the form “When $C(t)$ then $C(t+1)$ ”, where C is a collective event and t is a period when C occurs (Brown 2007, 510). That is clear a case of fossil fuel extraction in capitalism – to maintain the capitalism, and thus also to maintain an extraction of fossil fuels at $t+1$, the predominant extraction of fossil fuels at t must be the case. To extract an energy resource, you need some energy – and that energy can be gained only by extraction of a resource in a preceding period of time (Kerschner 2014, 131).

⁶ According to Brown (2007, 508–509).

Collective events are precisely what is grasped in analysis of ecological economics. Claiming for example that an economic growth is associated with the relative growth in extraction of main energy resources (Hall & Murphy 2011, 54) is not to assert mere correlation, but *a concatenation of collective events explicable as causal regularity*. Blurring the boundaries between natural and social sciences in study of socio-economic system, manifested also in pre-analytic vision of ecological economics, enables to formulate strict event regularities, because an ontological realm of social reality is inseparable from nature. This inseparability of social and natural can be clearly seen in ecological economic analysis, where socio-economic system is driven by forces of thermodynamics and is bounded by principal mechanisms of global ecosystem.

Economy is thus not an open system, but a closed system (Boulding 1966, 4–5). What does it mean? First of all, we have to distinguish between *closed* and *isolated* systems. A system which is isolated is a one that has no causal connections with its environment. In practice, it means that we cannot know about the existence of such system. On contrary, a closed system can be localised in space and time and is causally connected with its surroundings. In terms of ecological economics, it means that a closed system has inputs and outputs – flows of energy entering and leaving the system. Closed system is nevertheless distinguishable from the environment as a certain body of mass, i.e. it has material borders. Using the terminology of critical realism, closed systems posit intrinsic, but not extrinsic closures (Morgan 2014, 9). Nevertheless, causal conjunctions of two events occur in them, because they are intertwined with biophysical reality, which is subjected to causal regularities.

To sum up this section, from environmental perspective, economy is not only embedded in, interfering with or connected to ecosystem, it is a genuine part of the ecosystem itself. As far as the ecosystem is assembled from natural, biophysical objects, it follows that economic relations and activities are also biophysical in their nature. And when we say biophysical, we say behaving in a way that displays certain strict event regularities understood as collective events. Thus, to conduct ecological economic research means to formulate strict regularities, if one wishes to stay faithful to the pre-analytic vision of this discipline. Ecological economics thus conflicts with the ontology of critical realism.

5. Materiality / Who acts?

As I intended to show, Brown's notion of collective events and his critique of critical realism from positions of systematic dialectics is connected with the argument that we can't abstract from social practice when we think about the persistence of a given socio-economic system, formulated also in Wittgenstein's late work (Brown 2007, 512–513). As far as the notion of practice is essentially connected with our conception of social agency, this statement opens up two interdependent sets of questions:

- 1) Who are social actors? Is the scope of social agency restricted solely on human beings? Is there any room for *non-human* actors?
- 2) What is the role of *materiality* in persistence of a system? Are material objects mobilised in social relations to actively engage in persistence of a given system?

By using Bruno Latour's *Actor-network-theory* (ANT), my contention is that from environmental perspective a) social (or economic) agency cannot be restricted on human beings, and b) material objects are actively engaged in persistence of given socio-economic system. This picture contrasts the social ontology of critical realism, where the agency is granted only to humans and social world is on an ontological level radically distinguished from nature (Lawson 2006, 495; Lee 2012, 10; Morgan 2014, 12). Exclusion of non-human agency is however present also in Brown's systematic dialectics (Brown 2007, 504).

A socio-economic actor in critical realist's social ontology is simply understood as human actor who possesses intentional attitudes.⁷ Social reality is thus at least partly dependant on human beings and in the end they are the ultimate creators of social sphere, for it is being constructed upon their intentional states, similarly to John Searle's ontology presented in *The Construction of Social Reality* (1995). Human beings possess free will, that enables them to always act otherwise than what is prescribed in established social order, which explains why social reality is an unpredictable open system.

The agency of other entities is not discussed – they are just mere parts of surrounding environment, in terminology of critical realism called structure: “Much like sex during the Victorian period, objects are nowhere to be said and everywhere to be felt. They exist, naturally, but they are never given a thought, a social thought. Like humble servants, they live

⁷ See e.g. Morgan (2014, 12).

on the margins of the social doing most of the work but never allowed to be represented as such” (Latour 2007, 73). The problem here is that the distinction between actor and environment is relative to particular perspective (however, it is not arbitrary) and is a matter of historical and cultural change. A strict definition of social actor in critical realism can be contested by the idea of *materiality* – “the notion that social existence involves not only actors and social relations but also objects“ (Pinch & Swedberg 2008, 1).

Let me pose a question: Where exactly social practice (including science) happens? Surely in a material world and by means of material objects (Konopásek 2008; Latour 1993, 24; Latour 1998, 436–437). Moreover, these objects are not passive, they actively take part in social practice as actors. Why? Our life in a material world is negotiated not only between humans and collectives of humans, but also between us and objects in nature. That is precisely the case of Typhoon Haiyan from my introductory notes. The global ecosystem states through events like this the conditions under which an existence of human society is possible. The question of our relations towards objects is thus not just a question for natural sciences – it is at the same time the social and political question. The spread of social reaches new frontiers, far beyond the borders of human collectives.

Critical realism sticks to an old-fashioned sociological account in which social is understood as a distinct dimension, structure or order. *Social* is some special feature that makes an object an inhabitant of “social” world, it is a *differentia specifica* of an independent ontological level, that distinguishes it from another levels, such as geological, biological, chemical etc. It is a kind of a substance, a special stuff – similar to Aristotelian *ether*, as I have already mentioned. What is Latour’s alternative? To use his own words, „in the alternative view, ‘social’ is not some glue that could fix everything including what the other glues cannot fix; *it is what is glued together* by many other types of connectors“ (Latour 2007, 5). Society does not simply exists – it is repeatedly elaborated; assembled and re-assembled: “the social is not yet made“ (Ibid, 47). Practice – real-world material practice that mobilise wide range of actors – is an essential glue that makes continual becoming of social possible. Social sciences – including economics – then come to be studies of associations; practices of tracing the connections.

The materiality of social can be in fact best acknowledged in economic science – as theories from Aristotle and Xenophon to political economy of 19th century or (perhaps in many ways

controversial) school of Physiocrats indeed show us (Swedberg 2008, 60; 68–69). For example, Smith gives a very detailed account of wealth in his *Wealth of Nations* (1776) in terms of physical objects that constitute the wealth (Ibid, 69). He also emphasises that a real source of wealth is in labour, i.e. in physical practice conducted in a material world (Ibid, 70). Ecological economics just extended the realm of relevant material objects and processes that are genuine parts of economy to other natural objects and their assemblages, such as in the case of introducing ecosystem as a framework in which economic metabolism is situated.

Material objects are genuine sources of persistence of social. No abstract, underlying social force is needed, because social is made up and sticks together by means of *a*-social. As Latour (2007) speaks out: “It is always things – and I now mean this last word literally – which, in practice, lend their ‘steely’ quality to the hapless ‘society’. So, in effect, what sociologists mean by the ‘power of society’ is not society itself – that would be magical indeed – but some sort of summary for all the entities already mobilized...” (68). The same position can be found in Brown’s work: „*Contra* critical realism, social relations are not ‘deeper’ than, underlying or interacting with, social activities. Rather, there is one single actuality to which concepts of ‘social relation’, ‘social activity’ and ‘social structure’ all refer, albeit with differences in emphasis“ (Brown 2007, 513–514). To make social connections strong enough solely by means of virtual social forces would mean to invest a tremendous amount of effort, which is not possible in our “modern” world. Instead, non-human agencies have to be massively mobilised in order to maintain such a large network, as in the case of global economy.

The very definition of actor in ANT springs out from the acceptance of materiality as inherent part of social. Actor (or *actant*)⁸ is “*any thing that does modify a state of affairs by making a difference*” (Latour 2007, 71). Why? That is declared in another quotation from Latour’s *Reassembling the Social*: „If action is limited a priori to what ‘intentional’, ‘meaningful’ humans do, it is hard to see how a hammer, a basket, a door closer, a cat, a rug, a mug, a list, or a tag could act. They might exist in the domain of ‘material’ ‘causal’ relations, but not in the ‘reflexive’ ‘symbolic’ domain of social relations” (Ibid).

⁸ ANT has borrowed the term „actant“ from literal science, where agency is distributed to various exotic entities, e.g. dwarfs. See Latour (2007, 54–55)

Once objects intervene into our well-established notion of social, the image of social agency is disrupted. Action is not a domain of conscious human beings, it is distributed through the whole network. To make an event happen, a large set of entities has to be mobilised. Take an example of a flight of an airplane. Who exactly drives the plane? A pilot – that would be a typical answer. But let me examine this case in detail. To make a flight happen, we surely need to invoke a large body of another actors – navigators, communication systems, airports, fossil fuels, engineers etc. All these entities are in action while a plane flies above our heads, they are simultaneously engaged in action – an agency is distributed between all of them (Callon 2008, 34–36). An action is *overtaken*: “... the very word actor directs our attention to a complete dislocation of the action, warning us that it is not a coherent, controlled, well-rounded, and clean-edged affair. By definition, action is dislocated. Action is borrowed, distributed, suggested, influenced, dominated, betrayed, translated” (Latour 2007, 46).

Non-human actors are in critical realism a priori excluded. But such an exclusion is unjustified, once we see how important objects are in social order. It resembles the cartographer that is trying to sketch a continent by means of easily grasped geometrical figures (rectangles, hexagons, lines...), ignoring all the nuances of the seashores (Latour 2007, 23). In his effort, he tries to push reality to fit into preordained forms, and thus he violates the shape of an object he describes. To stay faithful to the reality, we need – as the cartographer – to give up our well-defined concepts and ground them in the inconsistencies of the world, populated by actors of many kinds. The final justification of our shift towards broader notion of actor is then the following one:

“... we are going to accept as full-blown actors entities that were explicitly excluded from collective existence by more than one hundred years of social explanation. The reasons are twofold: first, because the basic social skills provide only one tiny subset of the associations making up societies; second, because the supplement of force which seems to reside in the invocation of a social tie is, at best, a convenient shorthand and, at worst, nothing more than a tautology” (Latour 2007, 69).

Now, recall the pre-analytic vision of ecological economics: “*the human economy is embedded in nature*, and economic processes are also always natural processes in the sense that they can be seen as biological, physical and chemical processes and transformations...”

(Røpke 2004, 294).” The abasement of economy to the level of natural processes is a complementary motion to upheaving material objects on the social level. These two motions meet each other in a final picture of one shared reality of heterogeneous entities – a sort of *flat ontology*. Environmental point of view thus contradicts hierarchical ontology of critical realism, but is well-suited to engage in resolving problems that are not scientific in an ordinary sense – so called *post-normal problems*. But that is the story of a concluding chapter.

6. Conclusion: A non-modernist rationale

Once we know that social is not something only loosely connected to the Nature, a new meaning is rendered to this word. By social (in an old-fashion modernistic sense), we should mean from now only a small portion of entities and relations that are genuinely intertwined in actor-network, in a collective. The old term of *social* only “offers convenient shorthand to designate all the ingredients already accepted in the collective realm“ (Latour 2007, 11). But the totality of assemblage of social is significantly larger, as the last chapter intended to show.

In his ontological vision, Latour follows the steps of Gilles Deleuze and Félix Guattari. Not only per accident he has sometimes described ANT as an “actant-rhizome theory”, where the term “rhizome” refers to one of the central terms discussed in Deleuze’s / Guattari’s *A Thousand Plateaus* (1987). The ratio of their ontology – called geophilosophy – is in “thinking in association with, and as the affirmation of, the diversity and multiplicity of the continuous becomings of a fluctuating natural reality... it seeks to eliminate the traditional dichotomy separating humanity (as subject) and nature (as object) by "stretching out a plane of immanence...” (Hayden 2008, 29).

Nature and society are in this sense inadequate modernist categories that collapse into each other. Latour shows how the modern constitution – the ontological model of modernist project – was settled up by the practice of *purification*, an intellectual work of separating human activity from non-human world and shaping strict dual categories of culture and nature (Latour 1993, 10–11; 30–31). Work of purification (as manifested for example in Cartesian dualism) sorts out objects and subjects and allocates them to the reigns where they “naturally” belong; it makes reality well-defined and comprehensible. On the other hand, the precondition of existence of modern society is a simultaneous work of *translation* (or *mediation*), that blends natural and human bodies and creates hybrid networks, in which things are mobilized in order to petrify and extend social construction:

“Despite its human construction, the Leviathan [social construction] infinitely surpasses the humans who created it, for in its pores, its vessels, its tissues, it mobilizes the countless goods and objects that give it consistency and durability. Yet despite the solidity procured by the mobilization of things (as revealed by the work of mediation), we alone are the ones who constitute it

freely by the sheer force of our reasoning – we poor, naked, unarmed citizens (as demonstrated by the work of purification” (Ibid, 31).

This is the *asymmetry* of modernism. Nature inevitably invades into the pure social structure, but the clear cut between natural and cultural pertains. To regain a symmetrical position, we need to do an anthropological turn – to direct the instruments of ethnography at our own modern world, to decolonize the West from its own prejudice of modernism; the prejudice of a Great Divide between Us and Them (Ibid, 97). Indeed, last decades of ethnographic research have turned its attention towards the modern world and helped to clarify that in fact, we are the same as *pre-moderns*, and so that no Great Division has been ever established.⁹ The only difference between moderns and pre-moderns is in a scope of mobilization of objects and a level of proliferation of hybrid networks (Ibid, 105). However, this is not an ontological difference, but just a question of scale.

If we have never been modern, so our science has never been a modern one as well. A modern science can be imagined as a *normal science* from Thomas Kuhn's *Structure of Scientific Revolutions* (1962). This idea depicts science as a rigorous activity conducted in a well-established, consistent framework. In a period of normal science (in contrast to the situation of scientific revolution), fundamental propositions of given paradigmatic theory are not contested and innovations are strictly controlled. Disciplinary boundaries are also narrowly defined and research problems / areas overlap only exceptionally (Kuhn 1993, 19–20; 36–37). Normal science resembles an activity of puzzle-solving, as if every piece of scientific knowledge were on a table, as if the task of science were merely to rearrange the pieces in an adequate manner (Strand 2010, 623).

Critical realism accepts the framework of modern, normal science, for its ontology accepts nature/culture dichotomy, where problems and objects are clearly sorted out. From this point of view, it is incompatible with ecological economics, which has intuitively closer to flat ontology of actor-networks. But there is also another interesting aspect of critical realism. The argument against strict causal regularities is in fact within the modernist mainstream economic paradigm, for it adheres to the methodological obsession with regularities. The resistance against and insistence on existence of strict causal regularities in social order are

⁹ Just to mention Arjun Appadurai's brilliant monography *The Social Life of Things* (1986).

nothing more than two sides of the same coin. What we have to do is not to get rid of an obsession with formal-deductive method, but of the notion of scientific fact based solely on identifying recurrent courses of events in reality. There are numerous mechanisms generating scientific facts (granted there are many types of associations) and our task is not to exclude any of these mechanisms from any field of research. It means – besides other things – that strict causal regularities can be found also in social reality, as well as other procedures generating scientific facts.

Historically, society was understood as a realm of contingency, while nature as a domain of iron causal rules. Now, we ended up with only one level of reality, which is a realm of contingency and regularity at the same time. So yes, it is true that surprises happen and some events are spontaneous. But it is important to point out that surprises occur in both what could be coined as social and as natural reality in an old modernist constitution of world. Corruption of fences between nature and culture does not rule out the existence of strict regularities. One and the same assemblage of heterogeneous actors can display causal regularities in one respect and unpredictable events in other.

For this reason, it is necessary to look up for another vision of science, one that resembles more an unending fluid practice than a finished and solid framework. Such is the concept of *post-normal science*, where scientific work is a process of continual arrangement and re-arrangement of entities, as any other social (hence material) practice. In this process, we cope with problems involving *irreducible complexities and uncertainties*, such as the case of global climate change or biosafety issues (Funtowicz & Strand 2007, 265). These problems can be labelled as *post-normal problems*. At the same time, they are *non-modern problems* in the sense that they can't be grasped in the modernist scientific framework. The reason is that these problems are *complex*, i.e. they can be described using multiple and mutually irreducible narratives and dictionaries (Diaz-Maurin & Kovacic 2015, 211).

But when we talk about uncertainty in complex issues, we do not talk about *global* uncertainty, a total arbitrariness and unpredictability of behaviour of the system that is studied. Uncertainties arise also in systems whose general mechanisms can be described in terms of strict regularities, as the case of climate change shows us. We know pretty well how the climate behaves and what are some key factors influencing this behaviour. But still, we are at odds once we are trying to be fully precise and detailed in description of climate

patterns and in prediction of the future state of affairs, for the problem is a complex one. That resembles the idea presented in Brown (2007): from the individual perspective, a system may seem to behave largely unpredictably, but once we take a system-wide perspective, some regularities start to occur before our eyes (508).

An insistence on complexity of social can be found also in critical realism (Morgan 2014, 16). However, it comes to this conclusion by using an old-fashioned ontology that sticks to the hierarchical image of universe and radically different ontological layers. It cannot bring together fossil fuel resources, typhoons, politics and economic behaviour of consumers. Perhaps, it seems to be a marginal problem, but when we come to the question of to what extent some events are strictly regular, we cannot accept critical realism, for it exorcise a cornerstone of our understanding of global ecosystem, in which economic activity occurs and which is thus necessary for our comprehension of the nature of economy as such.

Now, to sum up the main theses of the paper, I argued that:

- 1) In ecological economics, we need to presuppose the existence of strict regularities, which are rejected by critical realism in the realm of socio-economical relationships.
- 2) The notion of social actor is in critical realism too narrow to include some key economic actors – notably the material, non-human parts of the environment in which the economy is localised.

Let me conclude with one final remark. The insistence on materiality of economic processes is tremendously important once we see how it influences our notion of social norms and policies. Ecological economists inform us about the nature, and thus about limits of real-world economies as aggregates of specific social practices. Consequently, they pose boundaries in terms of which our economic activity can be sustainably realized, and hence they provide a general framework for production of social and political norms that guide our economic activities. Ecological economics is in this sense engaged into the process of generating certain *politics* (or *regimes*) *of value* (Appadurai 1986, 57) and its purpose is to propose and criticise particular norms and normative systems from its distinct standpoint. Critical realism pleads for similar engagement of social sciences. But it does not purport a sufficient groundings for its justification.

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