TEXTO PARA DISCUSSÃO

ISSN 0103-9466

369

Economic theory and (ontological) reductionism: some pitfalls in the road of the microfoundations project

José Ricardo Fucidji
Celso Neris Jr.

Novembro 2019

Economic theory and (ontological) reductionism: some pitfalls in the road of the microfoundations project [*]

José Ricardo Fucidji [**]
Celso Neris Jr. [***]

Abstract

This paper aims to survey the literature on the theoretical endeavor of providing the "microfoundations of macroeconomics". To do so, it evaluates that project from the viewpoint of economic methodology, mostly of critical realism. Its novelty lies in analysing the reductionism inbuilt in the project and its unsuitability both to its own terms and to the purpose of illuminating socioeconomic reality. We also stress that, in addition to a project of science (the sound or rigorous way of doing 'scientific' economics), it includes an implicit ontology of market sociability that establishes links between microfoundations and the neoliberal ideology. Some attempts at overcoming the reductionist individualism of microfoundations are also evaluated, such as complexity theory and institutionalism, pointing out its potential and shortcomings. To do justice to a complex, hierarchically multi-level structured and open reality economic theory should not adopt explanations that give precedence to a single level. It should instead prefer approaches in which micro and macro levels are mutually conditioned and relatively autonomous.

Keywords: Economic methodology; Reductionism; Microfoundations.
JEL codes: B41, A14, B13.

1 Introduction

There is a huge literature on the microfoundations of macroeconomics, which is of much wider interest than academic debate, as it influences how macro policies are tailored, and with which persuasion strategies they are prescribed to governments and to the public opinion. Keynes would say that we are ruled by died economists. It is the truth, but not the whole truth. We are ruled by living economists who reinterpret Smith's, Ricardo's, Walras's, Marshall's, or even Keynes's thought in a specific way. This paper highlights the effects that interpreting (accounting or molding) the economy has on economic policy. To do so, the paper enquires what are the methodological (i.e., in what forms theory must be couched) and ontological (i.e., what it assumes, even implicitly, about the entities of social reality) implications of the microfoundations project.

In doing our ontological analysis of the microfoundations project of modern macroeconomics[1], we have chosen a philosophical ontology (i.e. the study of the relationship between theoretical entities and their

[*] Paper presented at the 46th Annual Meetings of the History of Economics Society, New York, 20-23 June 2019. We very much thank Jamie Morgan and John Latsis for their comments and suggestions to this version. The work underlying this paper was made possible by a grant of the São Paulo Research Foundation (FAPESP) (# 2018/07082-6) "Metodologia Econômica e a Abordagem do Realismo Crítico", and by financial support from Faepex-Unicamp (# 2399/18) which are duly acknowledged.

[*] Institute of Economics, University of Campinas – Unicamp, Brazil.

[*] Economics Department, Sao Paulo State University – Unesp, Brazil.

(1) By "modern macroeconomics" we mean the dominant theory until at least the financial crisis of 2007-8. It can be identified by the requirements that theories must be microfounded, viz. agents with substantial rationality (hyper-rationality) and rational expectations; dynamic stochastic general equilibrium (DSGE) models; and macro policies that assume non-neutrality of money in the short run. This theory is associated with the new Keynesian, new Classical and new Neoclassical Synthesis schools (Goodfriend and King, 1997). Moreover, our definition is close to Colander *et al.* (2004) on theoretical dominance in the academic community. Thus, "modern macroeconomics" and "mainstream" are here interchangeably used.

referents in the external world), rather than a scientific ontology (i.e. the study of theoretical entities in their own terms). That distinction is made, among others, by Lawson (2015, 22-28). We are not meaning that scientific ontology (or "internal metaphysics") analysis are of lower importance or value. There are lots of good analyses of this kind, particularly in Uskali Mäki's many contributions. However, critical imports are less evident in the latter kind of ontological enquiry. Evaluating the microfoundations project by its internal metaphysics (the role played by representative, hyper-rational agents in the theoretical schemata) would lead us to an account of its internal logic, very insightful as it may be, but it would halt there.

After surveying the outstanding problems of the microfoundations project, we relate them to its implicit reductionist ontology – which requires using philosophical ontology, as developed by critical realism. Following this lead and Soromenho's (2000) argument, the ontology of microfoundations project: is the sociability of independent producers (a simple mercantile society, where property asymmetries and capital accumulation are absent), in which the only social link is the contingent act of exchange. This ontological conception is suitable to the project in two ways: it maintains the agents' autonomy (deemed as atoms in their relations to one other); and, assuming that agents' behavior is strictly egoistic and hyper-rational, it draws implications to the systemic level, searching for coordination mechanisms to make individual plans mutually compatible.

Although this project complies with the methodological individualism desideratum, its ontological implications forcefully misrepresent what we know about real world agents. In other words: agents' behavior as required in the model is heroic or implausible relative to real decision-makers. Moreover, essential features of agents (such as the very possibility of free choice) and their environments (the supra-individual conditions) are explained away in order to facilitate project coherence with the postulates of free and perfect markets (postulates that would seem awkward to Smith, Ricardo, and maybe even to Walras).

The paper discusses, in Section 2, the problems of the project of microfounded economics, its ontological implications and consequences. Section 3 deals with some alternatives, pointing out to theories that are both contextual and empirically robust. Specifically, social institutions (as earlier argued by Hodgson) are picked as analytical units fruitful to the study of socioeconomic phenomena, in accordance with a realist ontology. Section 4 brings some final comments, stressing some risks of a proposed alternative (complexity economics) sliding back into reductionism.

2 Reductionism in modern macroeconomics

Reductionism is a proposition according to which, a whole must be completely explained in terms of its components. In a broad sense, reductionism can be defined as the conception that all the features of a complex phenomenon must be fully explained in terms of a single level or kind of entities. In this section we shall see how reductionism is associated with three aspects of modern macroeconomics viz., (i) its scientific project; (ii) the reinforcement it lends to a certain view of market sociability; and (iii) its leanings to the neoliberal ideology. We also briefly remark on the unfeasibility of reductionism in the presence of emergent phenomena.

2.1 Modern macroeconomics as a scientific project

"Reduction" is commonly understood as to make smaller, to decrease in number or size. In the philosophy of science, the term means to decompose or to make simpler a complex entity, as to reach its more basic components. There is a long tradition in Western thought, where it is used, metaphorically in references to "bridge laws" that connect theories from different domains (e.g. micro and macroeconomics). John King adopts, in discussing this topic, a definition given by the philosopher of science Kenneth

Schaffner: "Intertheoretic explanation, in which one theory is explained by another theory, usually formulated for a different domain, is generally termed *theory reduction*" (Schaffner, 1967, 137; author's italics). King asserts, just after this quote, that the microfoundations project (he calls it "dogma") is a special case of this general principle (King, 2012, 27). Prado (2006, 13) affirms that reductionism implies in dividing more complex objects into its small component parts and then explaining them conveniently, that is, explanation should "begin from simpler and easier to know objects, ascending, as if in a stairway, step by step to the knowledge of composites".

According to Hodgson (2000, 110), biological reductionism was used in social sciences as a form of explanation in the period 1870-1920. In biological reductionism, the behavior of individuals and groups is explained in terms of their biological characteristics. In the 1920s, however, biological reductionism was broadly abandoned by social sciences, having a revival later, with sociobiology in 1970s. In economics things are slightly different, not only because marginalist theories were mechanicist, as Hodgson also notes – and so not biology-inspired – but also because macroeconomics enjoyed a relative autonomy between the decades of 1930 and 1960. At the end of twentieth century, methodological individualism[2] was the main kind of reductionism used in social sciences generally and in economics in particular.

In economics, microfoundations – the fondness for explaining macroeconomic phenomena completely in terms of entities from the microeconomic domain containing, especially, optimizing agents with rational expectations – is a particular case of reductionism. Ganem (1996, 113; italics added) says that microfoundations of modern macroeconomics is a project that aims to identify "the collective laws that would reflect the individual maximizing behaviors" and that "this research field ended up imposing itself as the *only* rigorous (scientific) project. In the same vein, Hoffman and Pelaez (2011, 266; authors's italics) state that "the idea according to which the scientific approach must be *necessarily* based on any kind of (rational) individualism should be questioned". The idea of necessity, we add, implies that there is no room for alternative macroeconomic theories beyond the one with a particular interpretation of the microeconomic domain.

And that is why we claim that microfoundations reductionism is a scientific project. This project traces back to the old physicalist dream of logical positivism of the Vienna Circle. According to O'Neill (2004, 436) physicalism was a project of unification of sciences, that could take many forms: "(i) a reductionist project in which all the sciences would be logically derivable via bridge-laws from physics; (ii) a programme for a unified method which would be followed by all sciences; (iii) a project for a unified language of science; and (iv) a project that would integrate the different sciences, such that, on any specific problem, all relevant sciences could be called upon—a project for the 'orchestration of the sciences'". That ambition, although discredited and never accomplished, was influential in the scientific imagination of the twentieth century, deeply affecting the way of conceiving and of doing science. It survived, via Popper, in the requirement that social sciences must be based on a principle of individual rationality and, *pour cause*, on methodological individualism (Caldwell, 1991, 16; Hodgson, 2007, 212).

To Elster, methodological individualism is a doctrine according to which all social phenomena (its structure and change) are to be explained, exclusively, from individual properties, aims and beliefs. Such individual assumptions are useful to a project of science:

(2) Udéhn (2002, 497) defines methodological individualism as: "a principle, rule or programme telling historians and social scientists how to define collective concepts, explain social phenomena, and/or reduce macro to micro". And Janssen (2008, 600) explains that "the quest for microfoundations grew out of the widely felt, but rarely explicitly stated, desire to stick to the position of methodological individualism".

> [t]he basic building block in the social sciences, the elementary unit of explanation, is the individual action guided by some intention... Generally speaking, the scientific practice is to seek an explanation at a lower level than the explandum… *The search for microfoundations*, to use a fashionable term from recent controversies in economics, is in reality a pervasive and omnipresent feature of science (Elster, 1983, 20-24, author's italics; *apud* Hodgson, 2000, 104).

The rise of neoclassical economics after the 1870s consolidated reductionism in economics, by bringing forth an analytical framework in which individual choice, given by utility functions under constraints, was the gist of theoretical explanation. On this principle, individualism, reductionism and atomism were gradually intermeshed through the twentieth century. Hodgson argues that problems of choice under constraints became the dominant topic and it strengthened preferences/utility optimizing as a feature of utmost importance in economics. Hence, individuals are seen as social atoms:

> In the social sphere the human individual was seen as the fundamental unit of analysis: the indivisible particle in motion. Of course, it is accepted that individuals, like particles, are affected by their circumstances in the manner of the forces and constraints that impinge upon them. But in such an atomist social ontology the essential aspects of human personality and motivation are conceived as independent of the social relations with others (Hodgson, 1993, 70).

The atomist ontology is dovetailed to the reductionist methodology. In the microfoundations project, theories from different domains are unified by the requirement that macro phenomena must be reducible to micro level phenomena. Its corollary is an explicit epistemological monism, in which there is only one *scientific* way of interpreting and theorizing economic reality. A correlated issue is that the search for microfoundations strengthens a specific conception of sociability, premised on individual rationality and spontaneous order.

2.2 Strengthening a market-oriented conception of sociability

Modern macroeconomics is built on the ontological assumption that "individual components of the analytical architecture must necessarily be entities closed in themselves and externally related one to another" (Prado, 2006, 307). The specific features of entities represented in the macroeconomic models, as well as their internal relations with other entities, was gradually erased on behalf of the axiomatic deduction of implications of the individual's optimizing behavior. The possibility of individual behavior being oriented by supra-individual institutions, as well as idiosyncratic behaviors therefore denied. That is to say, these models assume that individuals are sealed off from determinations coming from the social structures they live in, and also that their internal structure is invariant, so as to facilitate homology between (or conflation of) ontologically different domains.

This impoverished account of the individual in methodological individualism, in economics as well as in other social sciences, carries an intractable analytical problem: either one cannot justify reduction (why to rest in the individual, and not in her psychological or biological determinations?) or it is unfeasible to reduce entities fully to their indivisible components (Hodgson, 2000, 111; Udéhn, 2001, 323-4).

Now, what is the microfoundations project implicit sociability? By sociability, we mean the kind of interaction among individuals that is assumed in theoretical contributions to this project. Soromenho (2000), drawing upon earlier papers by Persio Arida, gives an account of the market sociability implicit in the general equilibrium theory. By our turn, we have taken Soromenho's account, as it can be applied equally to the microfoundations project. Soromenho says that this conception of sociability was originally proposed by classical economists (a stylized commercial society populated by independent producers bonded by market exchange) and later resumed by neoclassical ones, in a thread that goes from Hicks to Samuelson to

Arrow and Debreu. In this idealized conception of society, exchange is the only social bond among commodities owners. In the last century, the task authors have assigned to themselves was to erase from mercantile order explanations any mention to supra-individual determinants. Individuals with their preferences, initial endowments and technologies were conceived as the only determinants of social outcomes. Therefore, it is all about explaining market workings exclusively upon individual attributes. Two issues are regarded, within that theoretical framework, as of scientific relevance: whether the agents plans are mutually compatible (whether there is spontaneous order in the market process), and how coordination of such plans is obtained (or how equilibrium is reached). Those are the well-known issues of existence, uniqueness and stability of the general equilibrium theory (Soromenho, 2000, 203 et seq.).

It would be beside the point harking back to the problems of research in the neo-Walrasian general equilibrium theory. Suffice it to say, for our purpose, that although it is regarded as hallmark of academic quality and rigor, the assumption according to which agents' level is sufficient to bring about order at the system level is far from having "sound foundations" in its own axiomatic terms. As Soromenho shows, existence of equilibrium can be demonstrated, but there are no impediments to multiple equilibria. In the latter case, the problem of uniqueness is added to the stability problem: in order to choose among a few of possible equilibria, one must know the past trajectory of the economic system, and thus its dynamic features – which are, by definition, out of equilibrium. However, notions such as rationality and mechanisms (if any) to converge towards equilibrium have much vaguer meaning out of equilibrium.

Albeit respectful of the conventional approach, Soromenho (2000, 208-9) points out that in order to get robust results of stability one needs to resort to supra-individual entities (the "well-organized" markets and "auctioneer" assumptions, as in Hahn and Neghishi's 1962 model; see Janssen 1991) and strongly constrain the individual rationality assumption (static expectations of future prices). There is no better testimony to the limitations of the general equilibrium hypothesis concerning individual substantive rationality and spontaneous market order – and about the alternative path one should follow.

We must distinguish, at this point, methodological from ontological individualism (Hodgson, 2007, 214-5). According to methodological individualism, social phenomena must be explained in terms of individual entities, but that implies *nothing* about the existence of other entities. However, the microfoundations project also implies an ontological individualism, namely, reality is composed of individuals and their contingent relations[3] to one another. If that is the case, then the microfoundations project embodies a normative feature: economic agents must be regarded only under the spotlight of (idealized) relations as wealth owners who are guided only by their self-interest. As we shall see later, this feature makes an association between the microfoundations of macroeconomics and the neoliberal ideology.

We argue that there are at least three implications stemming from this ontological individualism. Firstly, stating that foundations (building blocks) must come first is a constitutive metaphor that thoughtlessly assumes a distorted conception of theorizing in economics, opposed to its historical development and excluding alternative approaches. To establish this concept as the only right or scientific way of doing economics is, to say the least, detrimental to the development of economics as a science.

(3) Otherwise, if the relationship among entities are necessary (internal), then methodological individualism is impossible, as recognized even by Hayek (1967, 70-1; *apud* Hodgson (2007, 215): "The overall order of actions in a group is in two respects more than the totality of regularities observable in the actions of the individuals and cannot be wholly reduced to them. It is so not only in the trivial sense in which the whole is more than the mere sum of its parts but presupposes also that these elements are related to each other in a particular manner. It is more also because the existence of those relations, which are essential for the existence of the whole, cannot be accounted for wholly by the interaction of the parts but only by their interaction with an outside world, external both to the individual parts and the whole".

Moreover, the reductionist ontology of optimizing individuals has been exported to scientific endeavors outside economics. For example, *Freakonomics* is a best-selling book that applies the rational choice principles to problems investigated in other social sciences (for a critical evaluation, see Fine and Milonakis, 2009, chapter 6).

Secondly, since the microfoundations methodology is regarded as the only rigorous way of theorizing in economics, it grants academic advantages to its practitioners over economists that, for any reason, do not use it – "competitive advantages" in the market of ideas, in publishing in most prestigious journals, in getting their research funded, etc. This notwithstanding the fact that its success, in terms of sociology of science, is far beyond its actual achievements, except if "rigor and elegance" are the only criteria to evaluate theoretical work. In this case, scientific advance is regarded as a semantically and internally defined concept. Rigor and elegance should not overcome the external criteria of relevance and capacity to illuminate the social reality[4]. No wonder that, in spite of the internal consistency problems pointed out in his paper, Soromenho (2000, 214) gives a sociology of science argument for the persistence of general equilibrium theory as a benchmark of theorizing: it allows "wielding a set of (formal) techniques… in whose conversation other approaches engage in".

Thirdly, the microfoundations project is an attempt of suppressing the macro domain, thus denying autonomy of subject matter to macroeconomics, except for differences in level of aggregation and aims of the task at hand. In the well-known phrasing by Robert Lucas, the terms "macro" and "micro" should eventually disappear:

> most interesting recent developments in macroeconomic theory seem to me to be describable as the reincorporation of aggregative problems such as inflation and the business cycle within the general framework of 'microeconomic' theory. If these developments succeed, the term 'macroeconomic' will simply disappear from use and the modifier micro will become superfluous. We will simply speak, as did Smith, Ricardo, Marshall and Walras, of economic theory (Lucas, 1987, 108; *apud* Hodgson, 2000, 104).

In other quarters, continuing efforts are being made by economists to enlarge what we know about individual behavior (often resorting to other sciences) and its relationship to its multiple, fuzzy, changing, contexts. Here we think of recent developments in behavioral, experimental, and neuroeconomics, as well as approaches under the umbrella of complexity economics (Davis, 2008). This line of inquiry allows that micro and macroeconomy are distinct, though related, domains of economic reality. Contrary to, or in spite of, these efforts, modern macroeconomics has resisted to changing its axioms about individual behavior. We claim that resistance to change in mode of explanation accounts for the affinity between modern macroeconomics and the neoliberal ideology. Let us turn to this point.

2.3 Affinity between modern macroeconomics and neoliberal ideology

Denis (2004), in his paper on two rhetorical strategies of laissez-faire (viz., reductionist and holistic), states that in Modernity, individual self-interest should be articulated to the general interest in

(4) Here we part ways with Soromenho. If our interpretation is right, he subscribes to the semantic view of theories, according to which theories should not be evaluated by their correspondance to entities in the external reality (since no theory can fully attend to this requirement), but by their ability "to conciliate theory with facts [interpreted according to this same theory]" (Soromenho, 2000, 197-8). Elements of our dissent would involve broader issues of self-referentiality, abstraction and idealization. Suffice it to say that, allowing that all theories are unavoidably unrealistic, for all of them involve abstraction and idealization, it does not follow that different procedures of abstracting and idealizing (classical, neoclassical, Marxist, neo-Walrasian, etc.) should be regarded as equals from a methodological viewpoint (see Mäki, 1992 and Lawson, 1997, chapter 16).

order to be legitimated. That is to say, individual plans or aims should match, or at least be congruent to, collective ones. Two rhetorical strategies were thus used to account for this articulation or, in our terms, to construct the relationship between the micro and the macro level.

Drawing upon Denis (2004), we shall limit ourselves to the reductionist strategy. In his account of reductionist persuasion strategies through the history of economic thought, Denis delves into some nineteenth and twentieth economists, among whom we are interested only in Lucas and his conception of economic society. Lucas subscribes to Friedman's statement that economics is the study of "a number of independent households, a collection of Robinson Crusoes" (Friedman, 1962, 13), when he says that "an economic system is a collection of people" (Lucas, 1987, 29; both *apud* Denis, 2004, 344).

This phrasing implies, by allusions to number and quantity, that individuals are regarded as isolated entities, relating to one another in a contingent, external way (i.e., individuals are social atoms). Thus, we can note that the microfoundations project explicitly *creates* (or produces, or builds[5]) similarities of individual entities, such as households and governments. This analogy often shows up in public debate on austerity policies, as a powerful rhetorical resource, in as much as it equalizes (and so are the lay people taught) decreases in government deficits to a household struggling with its own budget. Now, by drawing upon this simple analogy between two very different (macro and micro) domains, modern macroeconomics is rhetorically more prone to influence the public imagination.

An example of the ideological bias of modern macroeconomics is given by Denis (2004, 344) when he discuss unemployment as a social disease. One could, he says, adopt at least two approaches: either (i) unemployment is an emergent phenomenon at macro level and is, therefore, unintentional; or (ii) it is the aggregate or sum of all individual decisions at micro level. Lucas unmistakably and emphatically adopts the second approach. According to Lucas (1987, 54), to explain why an agent allocates her time to an activity (leisure, i.e., the decision of being jobless), is to know her reasons to prefer this to all other available activities. According to Denis, 2004, 344-5), Lucas's aim is clear: if unemployment is mere summarization of individual decisions of staying jobless, then is possible to demonstrate that neokeynesian policy activism is misconceived.

Lucas's rhetorical strategy is reductionist. He asserts that one needs to solve separately the problem of "understanding laborers' individual behavior" and then explain the reason why they prefer, as an aggregate, other activities rather than work (Lucas, 1987, 68; *apud* Denis, 2004, 345). Unemployment is regarded simply as an individual choice, a private problem. If employment is freely decided in a work-leisure trade-off, then there is no social disease and government intervention is not needed. No wonder that new classical economics is famous for its propositions regarding the many kinds of macro policy inefficacy. Arguing for capitalism without government intervention is a neoliberal feature, common to the positions of Friedman and Lucas – and, more generally, of the Chicago School.

The new Keynesians loosened new classical propositions on unemployment as well as on policy inefficacy. However, they have taken the reductionist bent of new classicals by adopting the methodological proposition that macro must be explained by the microfoundations of optimizing individual behavior. Even though they argue for government intervention, their recommendations are always diffident, as can be seen in the literature on the independence of central banks. Only lately has expansionary fiscal policy been taken into account by modern macroeconomists, albeit without dispensing with the microfoundations requirement. That is why we claim a bond between modern macroeconomics and laissez-faire policies. In the same vein,

(5) Considerations of space hinder us from discussing the performativity thesis in economics (see Boldyrev and Svetlova, 2016). Our critical position is found in Fucidji, Almeida and Neris (2016).

the proposition of stabilization policies detrimental to economic growth (despite all its technical apparatus and jargon) is also an affinity with the mindset of neoliberalism. In this way, the microfoundations project is not just epistemologically monist and ontologically reductionist; it also strengthens and is supported by an ideology that accounts for its resistance to change.

2.4 Shortcomings of reductionism in economics

There is another way of regarding economic reality. If reality – including the economy – is multi-leveled, where complex, emergent and changing phenomena take place, then the reductionism of the microfoundations project is fatally unfeasible. Here we make some brief observations on obstacles that a realist conception of the economy presents to reductionism in economics.

A system is regarded as complex when the interaction among its components changes the overall system behavior, that is, new dynamics are created, defying a general statement of its workings. Certain analytical solutions for these systems are possible, but only if simplifying assumptions are taken, which falsify the real complexity of the subject (Hodgson, 1993, 75). A good characterization – as there are dozens of definitions – is given in the advertisement of the collection *Complexity in Economics* (Rosser Jr., 2004):

> Complex dynamics in economics arise from nonlinear systems that do not converge to a fixed point, a limit cycle, or explode or implode exponentially due to endogenous factors. They arise from cybernetics, catastrophe theory, chaos theory, or the varieties of modern complexity theory, including models with heterogeneous, interacting agents.

An example of complexity is chaos theory. It shows that tiny variations in the initial conditions can cause huge changes in results. It is, therefore, impossible forecast the workings of the system by studying its components – either because precision of initial conditions is poor, or because one cannot warrant a good description of interaction and feedback mechanisms operating among the components, or between them and the resultant system. Another example are simulation models of heterogeneous agents. Those models are able to display the workings of simulated theories but are, for this very reason, unsuitable to a general, unified formulation[6] (Squazzoni, 2010, 221). Hodgson (1993, 79-80) states that models with chaotic dynamics can produce order (and vice-versa, ordered models can produce chaos) since there is sufficient structural stability (defined as the ability to dissipate feedbacks and heterogeneity effects at the components level) in the system. Kirman is more skeptical about the possibility of complex dynamics being guided by attractors. According to him, such attractors are also liable to evolution, and it makes policy-making based on models even harder (Kirman, 2016, 536).

This brings us to the point of emergence. As well as complexity, there are many definitions of this concept (see Sawyer, 2001). Gilbert (2002), for example, uses "emergence" and "result" almost as synonymous. Still, for our purposes it is interesting to take an ontological definition of emergence, as given by Hodgson (1993, 78-9): an entity or phenomenon is emergent if it is formed by components at a lower level of reality, but is not reducible to these lower level components. A good example is given by biologist Ernst Mayr (1985, 44; *apud* Hodgson, 1993, 78): "every biologist would insist that to dissect complex biological systems into elementary particles would be by all odds the worst way to study nature". In the act of ontological reduction, properties or features of higher-level entities are lost. It follows that reality should be studied as a "structured hierarchy" where each level has *relative autonomy*, functioning by its own

(6) And maybe it is better this way. Models that are more sensible to specific factors and, because of this, can embrace historical and geographical specificities, are, overall, more useful than those that patently contravene the reality they should account for – for the sake of tractability or generality.

mechanisms and architectures and engendering emergence non-predictable from analyses of its components. An ontology of emergent entities is in accord, for example, with post Keynesian macroeconomics that have always denounced composition fallacies in macroeconomics. As stressed by Hodgson (1993, 80-1) the analytical aim is to elucidate the workings and interactions among components at a given level, as well as the interaction among levels.

Finally, there are many good reasons for incorporating evolution as a phenomenon of the ontology of economic reality. In modern macroeconomics, the homogeneous, representative agent is made by fiat (she is a solicitor of her micro clones) and she is unable to take non-optimizing actions, since it is assumed that she knows the model that describes the workings of the economy. Ironically, by this fiat, free choice, so dearly regarded by laissez-faire ideology, is falsified. As Lawson (1997, 30) points out: in models that deal with substantive rationality and "single exit" solutions, there is no real choice. Choice is only free when an agent, facing a situation S where the best choice supposedly is x, can chose x, or y, or any other different (innovative) choices. One should note that there are many accounts for non-optimizing behavior that do not imply "irrationality", from uncertainty about other's behavior to the Schumpeterian drive to break the routine. Moreover, complex and emergent and innovation phenomena are related and, as a block, are incompatible with the reductionist microfoundations project. Economic systems display complex and unpredictable (i.e. open) paths in this conception of ontology. Economists must pay more attention to partial, local, lower level regularities and investigate their interactions in order to be able to suggest some hypotheses about aggregate outcomes. Fears of this indetermination (an ontological feature) and our poor control over the system may be the (unspoken) rationale for the noted strong attachment to the deterministic models of modern macroeconomics.

3 Insufficiency of formalism as a solution to reductionism

Mathematical formalization as a privileged means of interpreting and intervening in economic reality is a key methodological feature of mainstream economics. Formal modeling is regarded as a higher ability of theorizing and as a borderline to demarcate economics from other (more "literary") social sciences. As said earlier, in mainstream models assumptions about individual behavior and systemic equilibrium are adopted for tractability and/or generality reasons, in flagrant opposition to a realist ontology of economics as social theory[7]

Economic theory has rested for too long on three fundamental assumptions: egoism, rationality and equilibrium (Colander *et al.*, 2004, 485). In fact, provided with those assumptions, it does not matter for the mainstream whether an American and a Pakistani have distinct behaviors. They are reduced, for theoretical purposes, to a single behavior. No wonder that international organizations or influent economists prescribe policies almost identical to countries that are structurally very different. The network of prestige created by positions in governmental agencies, international organizations and rating agencies promotes more and more adherence and allegiance to the mainstream, in scholarship as well as in society (here we are in accordance with the performativity thesis, see footnote 5). Whether in periods of economic crises one believes that this state of affairs should change – due to evident, discomforting anomalies – this net of influences in the economic system rescues most of the mainstream, at least for a while. For example, after

(7) Social reality (or domain) is here understood according to critical realism. Critical realists assume that there is an objective reality external to the scientific effort, that is to say, entities exist objectively and independently of the theoretical constructs of scientists. Social reality is conceived as open and structured, composed by three strata: empirical (where events or states are perceived by our senses); actual (events or states themselves) and real or deep (mechanisms underlying and producing items in the actual stratum). In fact, at each level or domain of reality (social, psychological, biological, chemical, physical, etc.) these strata are operative (See Lawson, 1997, 15-65 for details).

recent changes in cutting-edge economics, the scene in policy-making remains the same, or "the more things change, the more they stay the same" (Paley, 2013, 193, 203, 205).

Colander et al. (2004) used to be more optimistic. They suggest that what happens in cutting-edge economics changes the mainstream influencing future developments in the profession. Cutting-edge is a notion that includes even some works by critics of the mainstream, which implies that mainstream contents are often being challenged to update, modify and expand. Diversity of visions within the mainstream predicts future changes in economics:

> [t]he reality is more complicated; conventional economists often hold a variety of views simultaneously. If the variance of views increases, while the core remains relatively unchanged, the static characterization of the profession will not change, but its dynamic characterization will (Colander et al., 2004, p. 487).

More recently, in papers which discuss the role of economics and economic methodology in the financial crisis of 2007-8 (Colander *et al.*, 2009; Colander, 2010; 2013), they are less optimistic about change. They argue that economists should not be blamed for their inability to predict the crisis, because crises are of course unpredictable events. However, they should be criticized for their excessive reliance on certain models (i.e. DSGE) that allow only one kind of microfoundations and disregard the complexity of the real world (Colander, 2010, 419). Economists, moreover, were unable (or unwilling?) to communicate to the public the serious limitations of, and qualifications to, the models they were using. The authors suggest that formal models should be improved, turning economics into complexity economics. We shall return to this point. Now, one should note that, albeit most of critiques of formalism are not new, it is so deep-seated in economics that even jeopardizes the complexity economics alternative.

3.1 The crumbling of the microfoundations project

From the survey of problems faced by the general equilibrium theory (section 2.2) it is fair to say that according its own practitioners (*pace* modern macroeconomists), the scientific programme of drawing macro results exclusively from micro, standardized behavior, has failed. In sum, Rizvi (1994, 363) states that Sonneschein, Mantel and Debreu findings show that the assumption of individual rationality does not provide guidance to macroeconomic analysis, as it is insufficient to bring about the desired systemic regularities.

Hodgson (2000, 107) adds that, because of arbitrariness and stability problems in general equilibrium research programme, one can conclude that an economy populated by atomistic agents does not have sufficient structure to survive, as its states of equilibrium could be evanescent. Attachment to the microfoundations project thus involves a leap of faith in the "invisible hand" and in the agents' calculative abilities. This theoretical effort, Hodgson continues, resulted in nothing more than a "crippled hand", unable to order and coordinate at the system level, however simple the model. His categorical statement is that there is no exaggeration in claiming that the microfoundations project has crumbled (Hodgson, 2000, 108).

It is surprising, as pointed out by Soromenho (2000, 7-10), the disproportionate amount of research dedicated to general equilibrium (and microfoundations) in contrast to the lack of enthusiasm of theoreticians of general equilibrium with their own programme. Everything goes as if the noted problems were minor or esoteric details. Over four decades after the works of Sonnenschein, Mantel and Debreu, textbooks containing microfoundations are still issued, policy-makers still use models with representative agents and the financial theory employs the efficient markets hypothesis. In 1995 Lucas was awarded the Nobel Prize in Economic Science for "for having developed and applied the hypothesis of rational

expectations, and thereby having transformed macroeconomic analysis and deepened our understanding of economic policy".

It is beyond the scope of this paper to investigate the causes of this dissonance[8]. Hodgson's assertion that economics has become a field of applied mathematics is still valid. Theoretical research is almost only about techniques and the aim of illuminating real world phenomena has been blurred. Economic theory has become a "mathematical game" played by its own rules that are determined by the players, without bothering with the adequacy of the referentiality of their theories to reality (Hodgson 2000, 109-10).

It is important, however, to stress that the above is not a critique of mathematics in economics *per se*, and even less a defense of those who avoid it. In this vein, non-deterministic modeling, as those developed under the umbrella of complexity theory, are promising. Those models are an alternative way of formalizing theory, remarkable by its plasticity and ability to incorporate specific and idiosyncratic features of subjects that are to be modeled[9]. Still, the problem is not in mathematics, but in formalism as a scientific dogma (oxymoron) and in the ontological and methodological assumptions that guide formal exercises.

3.2 Methodologists as engineers?

Among the recent proposals of redirecting economics and economic methodology, we deal here with that of Colander (2013). As noted above, complexity theory, which he advocates, is a new and promising approach to theorizing. Colander claims that the 2007-8 economic crisis was a failure of the economics profession (and by its turn a failure of economic methodology) as economists were unable to persuade their colleagues about problems of conventional methods they employed. He mentions DSGE models and how economists spread it as the (only) scientific mode of interpreting and intervening. Informal models, based on insights about heterogeneous agents' interactions, are ruled out because they violate the standard assumptions of individual rationality and systemic coordination.

Colander (2013, 59-64) advances an alternative for economic methodologists: emulating engineering, practical and problem-oriented methodologies, rather than occupying themselves with too abstract, too philosophical issues. Methodologists, like engineers, should be problem solvers using rules of thumb and practical common sense, no matter how imprecise the solutions could be. Methods should be precise only if precision is required and easily achievable. Mainstream economists, on the contrary, lay utmost emphasis on issues of science and modelling, rather than on solutions to real-world problems. Colander's proposal implies that methodology would be also a field of applied economics, and its subject would be to investigate specific heuristics for any problem in economics applicable to problems in other economic pursuits. Economic methodology would be much less about abstract questions. Methodologists, then, would play the role of chief engineers helping other engineers to do their practical work.

We are in partial accord to Colander. On one hand, his proposal embraces the perspective of promoting more humble and sensitive works on problems in a lower level of abstraction. It has also the merit of stressing the pragmatic character of economics that of serving social aims external to the community of economists. On the other hand, his proposal is aloof to the problem of formalism. A turn in mainstream economics requires a serious consideration (and Colander's proposal apparently does not include this) of the ontology of economic subjects – in the sense of discerning methods suitable to subjects to be investigated or liable to intervention. To regard that question as "too abstract" or unnecessary is tantamount to investigating just the empirical stratum of phenomena, without saying anything about causes as "natural

(8) Elster (2009) brings forward some keen and provocative hints on this.

(9) For ahighly positive evaluation, see Squazzoni (2010) on agent based-modelling (ABM).

necessities" of phenomena, sliding us back to instrumentalism (Runde, 1998). In other words, Colander's proposal does not avoid the danger of producing a bunch of formal models, more sophisticated and superior to those of the mainstream, but, even so, insufficient to illuminate social reality.

The range of proposals for redressing economics must be broader, including non-formal analysis. There is no rationale for insisting in giving place of honor to formal modelling. Why must theorizing be done just this way? What is the matter with ordinary language approaches? Why rule out research that simply applies descriptive statistics and case studies? According to a well-known critical realist aphorism, methods should be suitable to the subject investigated – not vice-versa[10].

3.3 Institutions as units of analysis

Theories that take institutions as units of analysis (Hodgson, 1993) can be a proper way of eschewing reductionism, since they adopt a holistic and systemic approach. They have several advantages: (i) institutions provide (relatively) more stable regularities of social reality; (ii) they also provide a bridge (non deterministic, by virtue of the open nature of individual decision) between agents' actions and systemic results; (iii) they are not static constructs, as they represent the accumulated result of past actions, including modifications caused by actions of current generation; and (iv) they neither place micro above macro nor the opposite.

According to Hodgson, institutions are categories or principles relatively invariant in which analysis can be made. In old institutionalism championed by Hodgson, institutions are a much broader concept, ranging from technical conventions to consumption patterns (Cerqueira, 2002, 73). Institutions are defined as relatively durable behavioral patterns and habits of thought or routine. On one hand, these institutions are characterized by relatively durable behavior patterns and habits of thought, shaping how people interact within groups. On the other hand, the generation and selection of institutional variety explain changes in the social domain. This vision is, thus, interactive, with macro level emerging from the micro one, without reducing or conflating to one another.

The conception of social reality is, thus, very different. The economic system is conceived of as evolving, open and, for this reason, permanently out of equilibrium. Theorizing gives painstaking attention to the environment where firms and organizations operate, stressing that systemic features are capable of impinging on the behaviors of micro entities that compose social reality. Note that taking institutions as units of analysis does not imply that individual behavior should be assumed as passive to institutional forces, but that they are mutually constitutive of that reality (Chick, 2016, 100-1). The institutional approach is, therefore, in closer accordance with the principles of irreducibility and emergence than any sort of reductionism is. As said by Hodgson (2000, 119), "Fortunately, there are sophisticated alternative approaches in philosophy and social theory that emphasize the structured interaction of parts with wholes, and eschew single-level explanations".

4 Concluding comments

Colander et al. (2004) have suggested that current heterodox critiques of mainstream are nearly forty years old and, for this reason, they miss the point. It is not possible to characterize mainstream by the trinity of "rationality, egoism and equilibrium" anymore. According to these authors, economics is going to be more eclectic, advancing new hypothesis based on new computational and mathematical developments. Such new approach would allow a better analysis of a complex economic reality. However, our argument

(10) An argument for a broader pluralism along these lines is given by Vercelli (2016, 160-4).

is that the ontology of the individual (her mercantile sociability) and the attending reductionist methodology of modern macroeconomics does have several implications on, and a remarkable effect over, the supposedly "scientific" or "rigorous" way of doing economics, and so over policymaking.

One of these effects is the ever increasing (and deemed irreversible) mathematization of economics. Even complexity economics, which is an alternative to reductionist methodology pledges allegiance to mathematical modeling. Robert Lucas, in his critique of neokeynesian economics, not only have established "one way" of doing economics, but also (maybe unwillingly) have linked it to the neoliberal ideology. Thus, when arguing free choice among theories, Colander et al. (2004) should not neglect that some approaches are a priori excluded for its policy implications. They even affirm that some approaches can be rejected because their assumptions and methods are not suitable to what is currently deemed mainstream, but this does not dismay them: any new approach needs first draw attention of some economic elite member in order to make difference.

Moreover, it must differentiate what is mature knowledge from work currently being done in cutting edge economics, in another words, what is crystallized theoretical artifacts from work in progress. Most of conventional economics has been applied in several economic systems and is acting upon reality, in spite of any critiques in papers, seminars and meetings of economists. In this sense, orthodox economics is lingering heavily on current mainstream economics. Even if cririques are made by mainstream economists, economics seems more resilient to change than one would expect.

Other effect is the crystallization of the notion that macroeconomics must begin from "sound microfoundations". On this, although macro is certainly emergent from micro, it does not follow that there is only one (conventional) way of characterizing the behaviors and features of individual agents. It also does not imply disregarding macro level determinations on these same agents in the micro level. There are methods for studying and grasping the micro/macro interaction other than the conventional one – e.g. institutional analysis and simulation models. Nothing justifies conflating macro into micro, besides such a reduction is plagued with problems.

One escape from atomism is to regard a conception of social reality that allows a broader plurality of individual behaviors and individual/structure interaction, where those levels affect each other. We stress that institutional economics takes in the endogenous change of economic system from individual features and behaviors, the interaction among individuals as well as their interactions with the structure. Once again, one must note that the profession is resistant to change, however. One another effect of microfoundations project has been its exportation to the study of other subjects in social sciences. No wonder that the idea of optimization has invaded also the institutional approach. Or one could say that mainstream has taken a conception originally critical of neoclassical economics (with Veblen or Commons) and grafted it with criteria and constraints, making the individual once again passive to her system's determinations.

Thus, one should be cautious lest micro reductionism (that of either heterogeneous or hyper rational agents) or macro reduction (passive choice under constraints) forestall alternative theories. Struggle to escape from established theories, as Keynes famously said long ago, is hard because it is not about an external opponent, but about challenging our own habitual modes of thought.

References

BOLDYREV, I.; SVETLOVA, E. (Ed.) (2016). *Enacting dismal science: new perspectives on the performativity of economics.* London: Palgrave Macmillan.

CALDWELL, B. J. (1991). Clarifying Popper. *Journal of Economic Literature*, v. 29, n. 1, p. 1-33.

CERQUEIRA, H. G. (2002). Evolutionary economics: a systemic chapter of economics? [In Portuguese]", *Análise Econômica*, v. 20, n. 37, p. 55-79.

CHICK, V. (2016). On microfoundations and Keynes' economics. *Review of Political Economy*, v. 28, n. 1, p. 99-112.

COLANDER, D. J. (2010). The economics profession, the financial crisis, and method. *Journal of Economic Methodology*, v. 17, n. 4, p. 419-427.

COLANDER, D. J. (2013). The systemic failure of economic methodologists. *Journal of Economic Methodology*, v. 20, n. 1, p. 56-68.

COLANDER, D. J.; HOLT, R.; ROSSER JR., J. B. (2004). The changing face of mainstream economics. *Review of Political Economy*, v. 16, n. 4, p. 485-499.

COLANDER, D. J.; GOLDBERG, M.; HAAS, A.; JUSELIUS, K.; KIRMAN, A.; LUX, T.; SLOTH, B. (2009). The financial crisis and the systemic failure of the economics profession. *Critical Review*, v. 21, n. 2, p. 249-267.

DAVIS, J. B. (2008). The turn in recent economics and return of orthodoxy. *Cambridge Journal of Economics*, v. 32, n. 3, p. 349-368.

DENIS, A. (2004). Two rhetorical strategies of *laissez-faire*. *Journal of Economic Methodology*, v. 11, n. 3, ´p. 341-357.

ELSTER, J. (1983). *Explaining technical change*. Cambridge: Cambridge University Press.

ELSTER, J. (2009). Excessive ambitions. *Capitalism and Society*, v. 4, n. 2, p. 1-30.

FINE, B.; MILONAKIS, D. (2009). *From economic imperialism to freakonomics: the shifiting boundaries between economics and other social sciences*. London: Routledge.

FRIEDMAN, M. (1962). *Capitalism and Freedom*. Chicago: University of Chicago Press.

FUCIDJI, J. R.; ALMEIDA, R. F.; NERIS, C. (2016). *Performativity of economics*: clarifying terms and building bridges [in Portuguese]. Paper presented at the 44th Annual Brazilian Economic Meeting (Anpec). Mimeo.

GANEM, A. (1996). Establishing the rational order of the market: some reflections on an impossible project [in Portuguese]. *Brazilian Journal of Political Economy*, v. 16, n. 2, p. 105-122.

GILBERT, N. (2002). Varieties of emergence. In: SALLACH, D. (Ed.). *Social agents*: ecology, exchange, and evolution. The 2002 Agent Conference. Chicago: University of Chicago e Argonne National Laboratory, p. 41-56.

GOODFRIEND, M.; KING, R. (1997). The new Neoclassical Synthesis and the role of monetary policy. *NBER Macroeconomics Annual*, v. 12, p. 231-283.

HAHN, F. H.; NEGISHI, T. (1962). A theorem of non-tâtonnement stability. *Econometrica*, v. 30, n. 3, p. 463-469.

HAYEK, F.A. (1967). Notes on the evolution of systems of rules of conduct. In: HAYEK, F. A. *Studies in Philosophy, Politics, and Economics*. Chicago: University of Chicago Press, p. 66-81.

HODGSON, G. M. (1993). Why the problem of reductionism in biology has implications for economics. *World Futures*, v. 37, n. 2-3, p. 69-90.

HODGSON, G. M. (2000). From micro to macro: the concept of emergence and the role of institutions. In: BURLAMAQUI, L.; CASTRO, A.; CHANG, H. (Ed.). *Institutions and the role of the State*. New York: Edward Elgar, p. 103-126.

HODGSON, G. M. (2007). Meanings of methodological individualism. *Journal of Economic Methodology*, v. 14, n. 2, p. 211-226.

HOFFMANN, R.; PELAEZ, V. (2011). Economic psychology regarding methodological individualism. [in Portuguese]. *Brazilian Journal of Political Economy*, v. 31, n. 2, p. 262-282.

JANSSEN, M. C. W. (1991). The alleged necessity of microfoundations. *Journal of Macroeconomics*, v. 13, n. 4, p. 619-639.

JANSSEN, M. C. W. (2008). Microfoundations. In: DURLAUF, S. N.; BLUME, L. E. (Ed.). *The New Palgrave Dictionary of Economics*, v. 5, p. 600-604.

KING, J. E. (2012). *Themicrofoundations delusion – metaphor and dogma in the history of macroeconomics*. Cheltenham: Edward Elgar.

KIRMAN, A. (2016). Complexity and economic policy: a paradigm shift or a change in perspective? – a review essay on David Colander and Roland Kuper's *Complexity and the art of public policy*. *Journal of Economic Literature*, v. 54, n. 2, p. 534-572.

LAWSON, T. (1997). *Economics and reality*. London: Routledge.

LAWSON, T. (2014). A conception of ontology. In: PRATTEN, S. (Ed.). *Social ontology and modern economics*. London: Routledge, p. 19-52.

LUCAS JR., R. E. (1987). *Models of business cycles.* Oxford: Basil Blackwell.

MÄKI, U. (1992). On the method of isolation in economics. In: DILWORTH, C. (Ed.). *Idealization IV: inteligibility in science – Poznán Studies in the Philosophy of Sciences and the Humanities*, 26, p. 317-351.

MAYR, E. (1985). How biology differs from the physical sciences. In: DEPEW, D. J.; WEBER, B. H. (Ed.). *Evolution at a crossroads: the new biology and the new philosophy of science*. Cambridge, MA: The MIT Press, p. 43-63.

O'NEILL, J. (2004). Ecological economics and the politics of knowledge: the debate between Hayek and Neurath. *Cambridge Journal of Economics*, v. 28. n. 3, p. 431-447.

PALLEY, T. (2013). Gattopardo economics: the crisis and the mainstream response of change that keeps things the same. *European Journal of Economics and Economic Policies Intervention*, v. 10, n. 2, p. 193-206.

PRADO, E. (2006). Reductionist and systemic microeconomics [in Portuguese]. *Nova Economia*, v. 16, n. 2, p. 303-322.

RIZVI, S. A. T. (1994). The microfoundations project in general equilibrium theory. *Cambridge Journal of Economics*, v. 18, n. 4, p. 357-377.

ROSSER JR., J. B. (Ed.) (2004). *Complexity in economics*. New York: Edward Elgar.

RUNDE, J. (1998). Assessing causal economic explanation. *Oxford Economic Papers*, v. 50, n. 1, p. 151-172.

SAWYER, R. K. (2001). Emergence in sociology: contemporary philosophy of mind and some implications for social theory. *American Journal of Sociology*, v. 107, n. 3, p. 551-585.

SCHAFFNER, K. F. (1967). Approaches to reduction. *Philosophy of Science*, v. 34, n. 2, p. 137-147.

SOROMENHO, J. (2000). Microfoundations and sociability [in Portuguese]. *EconomiA* (Anpec), v. 1, n. 2, p. 185-219.

SQUAZZONI, F. (2010). The impact of agent-based models in the social sciences after 15 years of incursions. *History of Economic Ideas*, v. 18, n. 2, p. 197-233.

UDÉHN, L. (2001). *Methodological individualism*: background, history and meaning. London: Routledge.

UDÉHN, L. (2002). The changing face of methodological individualism. *Annual Review of Sociology*, v. 28, p. 479-507.

VERCELLI, A. (2016). Microfoundations, methodological individualism and alternative economic visions. *Review of Political Economy*, v. 28, n. 1, p. 153-167.