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ПРИЧИННОСТЬ, МОДЕЛИРОВАНИЕ И СОЦИАЛЬНЫЕ НОРМЫ: ИХ МЕСТО В ТЕОРЕТИЧЕСКОМ ЯДРЕ ГЕТЕРОДОКСНОЙ ЭКОНОМИКИ

СИНДЗИНГРЕ АЛИСА НИКОЛЬ,

приглашенный профессор,
Школа восточных и африканских исследований,
Университет Лондона,
Центр экономики,
Университет Париж-Север-13,
email: ansindzingre@orange.fr

Дефиниции, используемые в рамках неортодоксальных экономических теорий и теоретические положения, составляющие их ядро, по-прежнему являются предметом дискуссий, равно как и определения и положения в рамках экономического мейнстрима. В связи с этим обсуждаются теоретические элементы, которые бы способствовали однозначному разграничению обеих позиций. В рамках неортодоксальных течений непросто выделить общие черты. Точно так же и мейнстрим нелегко описать посредством необходимых и достаточных характеристик, поскольку многочисленные авторы, по их собственным утверждениям, своим вкладом обогатили неоклассический экономикс, привнеся в него концепции из других социальных наук. С другой стороны, создаётся впечатление, что политику представителей неортодоксальных направлений и её отличия от мейнстрима (например, в ноошении «строгости») легче идентифицировать. Несмотря на неопределенности данного характера, в настоящей статье показано, что некоторые ключевые концепции и теоретические допущения могут служить водоразделом между неортодоксальными течениями и экономичсеким иейнстримом. Значимость статьи заключается в обосновании того, что множество считающихся привычными различий между данными областями на самом деле не могут рассматриваться в качестве однозначных критериев для разграничения эпистемологических основ этих двух областей (например, эгоистичные агенты, методология моделирования, использование концепций социальных наук). Также в статье предложены несколько теоретических аспектов, которые могли бы служить ориентиром для такого разграничения – в частности, связанные с принципом причинности, концепциями времени и общества.

Ключевые слова: *гетеродоксная экономика; методология экономической науки; моделирование; причинность; методологический индивидуализм; социальные нормы.*

CAUSALITY, MODELLING, SOCIAL NORMS: AMONG THE THEORETICAL CORES OF 'HETERODOX' ECONOMICS?[1]

ALICE NICOLE SINDZINGRE,

Visiting lecturer,
School of Oriental and African Studies (SOAS),
University of London,
Centre d'Economie Paris-Nord (CEPN),
University Paris-13 (France).
email: ansindzingre@orange.fr

The definitions and theoretical cores of 'heterodox' economics remain subject to debate, as do those of 'mainstream' economics. The theoretical elements that could unambiguously differentiate both perspectives are therefore debated. Common features are difficult to highlight within 'heterodox' economics. Symmetrically, 'mainstream' economics is uneasy to describe via necessary and sufficient features, as numerous authors within its field claim to have enriched neoclassical economics, and to use concepts from other social sciences. On the other hand, 'heterodox' policies and their differences with mainstream ones (e.g., 'austerity') appear to be more identifiable. Despite these uncertainties, the paper shows that some core concepts and theoretical assumptions may represent a distinction between heterodox and mainstream economics. The contribution of the paper is to argue that many conventional distinctions may in fact not be unambiguous criteria of distinguishing the two epistemic frameworks (e.g., self-interested agents, the methodology of modelling, use of concepts of social sciences), and to suggest a few theoretical issues that could constitute lines of difference – notably related to the concepts of causality, time and society.

Keywords: *heterodox economics; economic methodology; causality; modelling; methodological individualism; social norms*

JEL: *B00; B5*

1. Introduction

The definitions and theoretical cores of 'heterodox' economics remain subject to debate, as do those of 'mainstream' economics. The theoretical elements that could unambiguously differentiate both perspectives are therefore debated.

The field of 'heterodox' economics is divided, thereby affecting the use of the concept, as the latter includes approaches in which common features are difficult to highlight (post-Keynesian, 'old'-institutional, Marxist, Austrian, etc). Centrifugal forces, and even deep disagreements (*Dobusch* and *Kapeller, 2012*), are such that, e.g., a Marxian economist can view agent-based models, or economics of complexity, as fully 'mainstream' and hence open to criticism. Similarly, Schumpeterian economics may be viewed as 'mainstream' by some 'heterodox' economists, but part of 'heterodoxy' by others; likewise, Austrian legacies can be viewed as 'heterodox', as they diverge from the neoclassical framework, but as situated outside heterodoxy in their defence of 'freedom', Hayekian 'spontaneous order', and in their support for the restraining of state intervention[2]. As argued by Boyer (*2017*), economics, and especially macroeconomics, has been characterised by the abandonment of general theory together with a rise in applied economics, and the various heterodoxies 'struggle separately to conquer hegemony' rather than seeking to define common bases.

[1] This paper was presented at the 30th Conference of the European Association for Evolutionary Political Economy (EAEPE), in the Special Session 'History, definition and theoretical cores of heterodox economics', Nice, 6-8 September 2018.
[2] See, for example, the views advocated by the Mises Institute. https://mises.org

The very word 'heterodoxy' as a unifying concept may likewise be debated, and its link with the discipline of economics is a question in itself. Other social sciences are less affected by such a disjunction within their domains: e.g., the expressions of 'heterodox linguistics', psychology, political science, etc, which could constitute sub-fields contrasting with 'orthodox linguistics', etc., are less recurrent in these disciplines – though occurrences exist (*Phelps* and *White, 2018*). Some non-mainstream economists indeed avoid the term 'heterodox' (as shown by, e.g., *D'Ippoliti* and *Roncaglia, 2015; Mearman* and *Guizzo Archela, 2018*). Moreover, for some observers sharp contrasts between mainstream and heterodox approaches may be 'counterproductive' and 'unconvincing' (*Hodgson, 2005*).

Symmetrically, 'mainstream' economics in the 21st century is uneasy to describe via necessary and sufficient features. Moreover, numerous authors within its field claim to have enriched the frameworks of marginalism or neoclassical economics, and to use concepts from other social sciences (e.g., among others, in institutional economics, positive political economics, or behavioural economics).

While the conceptual cores of 'heterodox' theories may not be easy to define, on the other hand, 'heterodox' policies and their differences with mainstream ones (e.g. 'austerity', privatisation, liberalisation vs. state intervention; supply-side vs. demand-side; 'capital' vs. 'labour', etc) appear to be more easily identifiable.

Despite these uncertainties, it is shown that some core concepts and theoretical assumptions may represent a distinction between heterodox and mainstream economics. The contribution of the paper is thus: i) to argue that many conventional distinctions may in fact not be unambiguous criteria of distinguishing the two epistemic frameworks (e.g., mainstream economics would be characterised by a conception of individuals as driven by their interest, by methodological individualism, by modelling as an exclusive methodology, or by the dismissal of history or other social sciences); and ii) to suggest a few theoretical issues that appear under-investigated and constitute lines of differences between the two frameworks: i.e., respectively, the concepts of causality in the context of modelling, time and society - examined via the concept of social norms.

The paper is structured as follows. Firstly, it presents a series of distinctions that the literature analyses as distinctions between the two frameworks, and shows that, in fact, they appear to be ambiguous and do not constitute necessary and sufficient criteria. Secondly, in this context, the three issues of causality, time and conception of society are analysed as relevant elements of distinction between the two frameworks.

2. The difficulty in drawing unambiguous distinctions

2.1. Defining 'mainstream' and 'heterodox' paradigms?

The literature is vast on the theoretical concepts that would characterise mainstream economic and heterodox perspectives, and this all the more since this is addressed within different disciplines, e.g., economic theory (macro and micro), epistemology, history of economic thought or methodology. This is why only a few points are discussed here, which can be viewed as important and under-investigated.

Mainstream economics?

'Mainstream economics' is notoriously difficult to define and the expression may be refused by the economists who otherwise are said to support its framework. It may refer to marginalism, which has modelled economic outcomes in assuming the existence of a general equilibrium with an hypothetical auctioneer, the economic behaviour of individuals being driven by prices as signals, and which has developed a concept of value grounded on that of utility. It has been noted that the main thinkers of marginalism (Leon Walras, William S. Jevons, Carl Menger) did not use the expression 'neoclassical', which was in fact coined by Thorstein Veblen in 1900 (*Aspromourgos, 1986; De Vroey* and *Pensieroso, 2018*).

The concept of 'mainstream' economics remains debated and the strongest disagreements may occur within mainstream economics (*Di Maio, 2013*). For example, Walras' objective of establishing economics as a 'mathematical science' with mathematical models being 'truer than any other' was contested by a contemporary mathematical economists such as A. Cournot (*Ragni, 2018*). Equally, for some, the most important dissenters vis-à-vis mainstream economics do not come from heterodox economics, but from within the mainstream (*Backhouse, 2010*, who cites George Akerlof, Amartya Sen, Herbert Simon and Joseph Stiglitz as these key dissenters). Also, the fact that marginalism is a school of thought that succeeded classical political economy and preceded neoclassical economics remains debated (*Lawson, 2013*). Similarly the definition of classical political economy and the concepts it would have elaborated are a matter of debate (*Martins, 2013*): e.g., the analyses of a thinker such as Adam Smith have induced a great number of theoretical frameworks that can be viewed as contradictory (*Weingast, 2018*). Similarly, the deepening by Kenneth Arrow and Gerard Debreu of general equilibrium, according to some authors, can be viewed as dissenting or not, integrated or not, in the paradigm of general equilibrium (*Düppe, 2012; Pignol, 2017; Berta, 2000*).

'Mainstream economics' may also refer in the economics literature to the kind of economics that developed after WWII. Gathered under the expression of 'neoclassical economics', the latter typically assumes that economic agents maximise their utility and that this maximisation drives markets toward stable equilibria.

In the 21st century, however, such definitions of the 'mainstream' may have become less relevant in the context of the rise of applied economics (*Backhouse* and *Cherrier, 2017*), especially microeconomics at the expense of macroeconomics. This rise and associated pre-eminence of applied studies have been intensified by the availability of databases and 'big data' – features extraction from unstructured very large databases. Some mainstream studies may now claim that to be 'a-theoretical' constitutes 'real' and 'credible' science that avoids the 'ideological *a-prioris*' of theories (such as, among others, heterodox assumptions or qualitative analytic methods). In this perspective, the availability of a database is the start of an analysis, and good mainstream economics is the search for some correlation that statistical techniques can extract from that database, the latter being viewed as the essence of scientifically presented empirics. For example, the availability of satellite data on earth lights has generated a vast literature correlating them with growth, income, inequality, institutions, crop production, etc. (*Donaldson* and *Storeygard, 2016*), and collection of data has become a highly regarded research activity – an example being the 2017 John Bates Clark medal awarding the analysis of Indian railways by Donaldson (*2018*), who considers that economics is 'the physics of the social sciences, or physics for public policy' (*Edwards, 2018*).

Heterodox economics?

'Heterodox' studies may thus be critical of certain positions of the abovementioned various branches of economics, but not others, and therefore 'heterodox' stances may be as diverse as the branches of economics that constitute the 'mainstream'. Moreover, 'heterodox' critiques of mainstream economics may deploy at the macro level or at the micro level. Equally, these critiques can be theoretical or empirical; similarly, they may be 'internal' – refutation by inconsistencies – or 'external' critiques – refutation by other theories or facts (*Hong, 2018*).

The focus on methodological issues appears to constitute a commonality of the critiques of the 'mainstream', with non-equilibrium, or historical modelling, being core elements: a commonality to Marxian, neo-Austrian and post Keynesian economics – that would contrast with mainstream economics – would thus be 'meta-methodological', with the latter being deductivist, reductionist and based on mathematical formalism, and the former relying on pluralistic reasoning and analysis of real problems (*Dow, 2011; Lee, 2009*). A common heterodox critique would thus be the opposition to the use of mathematical modelling, with its

expansion throughout the 20th century, as an exclusive tool of argumentation (*De Vroey* and *Pensieroso, 2016*). Hence heterodox studies would use concepts such as process rather than equilibrium, and, moreover, they would reject 'mathematical-deductivist methods' (*Lawson, 2005*). Heterodox studies here demonstrate that mainstream economics has substituted a method – i.e., the exclusive use of mathematical models, or mathematisation – to content (*Sindzingre, 2017b*).

In addition, mainstream economics is often confused with the policies that are inspired by it, and which are usually coined as 'neoliberalism'. 'Neoliberalism' is also notoriously difficult to define, as it does not form a coherent set of theoretical assumptions and subsequent policies. 'Neoliberalism' are more a nexus of policies that adapts to circumstances than a coherent set of theoretical hypotheses (*Harvey, 2005; Steger* and *Roy, 2010; Blyth, 2013; Sindzingre, 2015*). Confusion is also increased by the fact that 'neoliberalism' refers to various kinds of political economies, from democracies to the authoritarian exercise of power (*Andersson* and *Godechot, 2018*).

2.2. The difficulty in establishing indisputable distinctions

The literature is similarly vast regarding the features that would distinguish heterodox from mainstream economics, similarly because of the plurality of the definitional features of both perspectives.

It cannot obviously be the aim of an article to be an exhaustive review of both strands of economic literature and their distinctive features. Rather, a series of assumptions is selected, which are usually said to constitute differences between the two frameworks: on the side of mainstream economics, the representation of the individual as a self-interested economic agent, modelling as an exclusive method, and isolation from the other social sciences. It is argued that recent developments of mainstream economics have made it so that in fact these features no longer constitute distinctive traits between the two conceptual frameworks.

Methodological individualism, and the selfishness of economic agents?

Mainstream economics' methodological individualism could thus constitute an assumption that delineates a difference: yet heterodox models may also rely on individuated units to which a modeller assigns individualised rules of behaviour, e.g. agent-based models. Equally, the assumptions that the economic agent is moved by her selfishness and by the maximisation of her utility is often considered as an unambiguous difference between the 'heterodox' paradigm, the latter refuting the universality of such an assumption, and the former supporting it.

On the one hand, the Walrasian framework of general equilibrium and perfect competition depicts an agent who is indifferent to others, because behaviours are driven by prices, and strategic behaviour has been conceptualised later, notably by game theory and behavioural economics. On the other hand, the fact that human beings are driven by some interest, however, is difficult to refute – e.g. at least some 'striving to persevere in being', to paraphrase Spinoza – and moreover utility can be 'maximised' by behaviours that go against the apparent interest of an economic agent (as in 'unconditional commitments' and sacrifices of life for values, (*Atran, 2016*)). Differences actually relate more to the vectors of such interest, i.e. social groups rather than individuals (*Sindzingre, 2017a*).

Mathematical modelling?

Likewise, modelling, quantification, or the use of econometrics could also constitute criteria of mainstream literature, as mathematisation is recurrently underscored in heterodox studies for being one of the main characteristics – and flaws – of the mainstream, while other (e.g., qualitative, analytical) methods would be privileged by heterodox economics. Yet post-Keynesian models, stock-flow consistent models, or agent-based models all use modelling, which can be as sophisticated as mainstream ones, e.g., DSGE models or others. Economics

of complexity, for example the pluridisciplinary research conducted at the Santa Fe Institute, which explores the emergence of social structures via, e.g., networks or agent-based models usually viewed as 'heterodox', typically relies on mathematics.

Equally, thinkers such as Hyman Minsky have highlighted the fundamental instability of financial markets and the subsequent possibility that economies follow a path of disequilibrium: yet he used 'mainstream' concepts and theories such as those of 'principal-agent' or moral hazard, and the later development of approaches such as behavioural finance, which can be viewed as 'mainstream' have supported the theses of disequilibrium paths (*Veneroso, 2018*). Conversely, at the beginning of the 21st century some studies in mainstream macroeconomics have put forward theoretical stances that questioned the neoclassical framework. Among many examples are Olivier Blanchard's suggestions of considering IS/LM and Philips curves rather than aggregate demand and supply, in line with a focus on economic instabilities (*Brancaccio* and *Saraceno, 2017*).

Policies?

Similarly, at the level of policies, international financial institutions that are viewed as typical supports of the mainstream framework, such as the IMF, contribute to the blurring of distinctions between what would be understood as 'orthodox' and 'heterodox' economic policies, which is compounded by the inherent lack of coherence of the set of policies gathered under the term of 'neoliberalism'.

For example, the IMF may support state intervention in line with its mandate of surveillance of the fiscal deficits of its members (in contrast with the World Bank, which is a development bank and has a different mandate). Likewise, in 2016 an IMF study acknowledged the failure of policies supported by the neoliberal framework (*Ostry et al., 2016*). Likewise, it has even been argued that the IMF has taken a heterodox stance in the mid-2000s as it recommended progressive taxation and intervention of the state in the economy (*Ban* and *Gallagher, 2015*). This has contributed to the blurring of distinctions, and the difficulty in finding necessary, sufficient, indisputable criteria which would separate the two paradigms.

Evolution and history?

Considering evolution or history as pivotal concepts could also distinguish heterodox perspectives from mainstream ones (e.g., the pioneering critiques of neoclassical assumptions of market equilibrium and profit maximisation by *Nelson* and *Winter, 1982; Dosi* and *Nelson, 1994*)[3]. Yet game theory situates itself in an evolutionary perspective with the concepts of learning and strategic behaviour (*Fudenberg* and *Levine, 1998*), and has biological models as a background (*Axelrod* and *Hamilton, 1981*) (the theory of social interactions also refers to an evolutionary approach, *Durlauf* and *Young, 2001*). The fact that these theories may be at the borders of the mainstream framework remains a matter of debate (*Friedman, 1999*). Similarly a methodology such as running iterations in order to observe adaptive and learning behaviour is used by mainstream and heterodox models (e.g., agent-based models).

Likewise, neoinstitutional economics has been built from the seminal studies in the economic history of the United States by Douglass North and Robert Fogel, and the literature they inspired (e.g., Greif, (2006), and his analyses of the pre-modern Genoese and Maghribi traders) shows that evolutionary approaches may be used within neoclassical or functionalist frameworks (e.g. functions of minimising transaction costs, preserving reputation, among others mechanisms).

Equally, many models of long-run growth take into account history while remaining in a mainstream paradigm, e.g. via post-Malthusian assumptions allowing for theorising the relevant determinants of growth, notably the interaction between technological change and demographic transition (*Galor, 2005*); similarly, a vast literature has enriched the Solow

[3] As also indicated by the name of the EAEPE, European Association for Evolutionary Political Economy…

or endogenous growth models with a variety of variables, including historical ones, e.g. variations in productivity, demography, 'institutions', etc., with many linkages with studies in world economic history, notably those analysing divergence across regions (*Pomeranz, 2000; Clark, 2007*).

Openness to other social sciences?

Similarly, openness to other social sciences is often said to characterise the heterodox framework and could constitute a difference between the two paradigms. Yet, mainstream economics increasingly claims that its openness to social sciences (while claiming not to be one of them) has modified several mainstream assumptions (*Hedoin, 2010*). For some, mainstream economics is even no longer neoclassical and has become pluralistic, being open to psychology and having abandoned the concepts of rationality, selfishness and equilibrium: experimental economics, behavioural economics and neuroeconomics would be the mainstream's 'new pluralist' subfields (*Hands, 2015*). Topics 'at the border' such as inequality or political economy, the latter using concepts from political science such as interest groups, elites, etc (*Acemoglu* and *Robinson, 2012*) are now fully integrated in mainstream economic studies. Simultaneously, it has been argued from within heterodox circles that heterodox economists could 'survive' only if they become more like mainstream economists (*Lee, 2012*).

Behavioural economics is an example of a branch of economics where several studies claim to depart from the neoclassical framework (even being a 'revolution' in mainstream economics, (*Schettkat, 2018*)). In line with H. Simon's findings on the bounded character of rationality, behavioural economics argues that the results of many psychological, economic and sociological laboratory and field experiments deviate from the framework of rational choices, that neoclassical assumptions regarding utility or profit maximisation fail to explain human behaviour, and that human reasoning functions via heuristics and is characterised by biases (among a vast literature, (*Kahneman et al., 1982; Gigerenzer* and *Selten, 2001; Camerer* and *Loewenstein, 2004*)). Similarly, behavioural economics claims that it takes into account not only the individual, the economic agent, but also the 'other' individuals – e.g. with concepts such as other-regarding behaviour, fairness, etc. Indeed, concepts such as 'altruism' and 'strong reciprocity', which derive from the behavioural perspective, have been analysed by economists often viewed as 'heterodox' (*Bowles* and *Gintis, 2011*) and have worked in a pluridisciplinary approach, e.g. with psychologists and anthropologists (*Henrich et al., 2004*). Behavioural economics has also contributed to blur the conventional distinctions between macro and microeconomics, as it has been used to reassess the theories of Keynes (*Pech* and *Milan, 2009*) as well as mainstream models such has DSGE models (*De Grauwe* and *Ji, 2018*).

3. Deepening three distinctions between the two frameworks

It is argued that other distinctions may therefore delineate differences between the 'mainstream' and 'heterodox' conceptual frameworks and hence some theoretical cores of heterodox economics.

3.1. An 'heterodox' core: against reductionism, conserving the complexity of the causalities?

Firstly, effective distinctions may relate to the concept of causality, as analytic reflections on causalities and mechanisms appear to be a core for heterodox economics (in particular, on the 'direct interdependence among many and heterogeneous agents' (*Elsner, 2017*)). In a complementary line, the reflection on the concept of 'truth' may also be a core for heterodox economics – understood as a reflection on the nature of the reality and how to represent it, the causal processes that occur in its elements, and the ways of approaching it.

Reduction

Reflection on economic causalities and the theories that can represent them may be a core of heterodox economics, which constitutes a sharp distinction with the 'a-theoretical' stance that characterised a part of the 'applied turn' that has affected economics since the end of the 20th century. For example, a rising trend in economics, particularly since the beginning of the 21st century, such as the use of experiments (laboratory, field or 'natural' experiments) in order to underscore some relationships between two phenomena, constitutes a continuation of mainstream assumptions that causalities based on a 'as if' and on reduction produce valid representations of the world and its dynamics. Randomised controlled trials (RCTs) constitute an extreme case where theoretical *a-prioris* and assumptions on causalities are explicitly rejected (*Sindzingre, 2018b*). Even a recognised economist such as Angus Deaton (2015 Nobel Prize) has explained the epistemic impossibility of such a claim of 'a-theory' that would be a proof of scientificity: via the example of a typical mainstream method – where method has become the content – such as randomised experiments, he has shown that even in RCTs, theory is always required to explain the hypotheses and results (*Deaton, 2010*). Similarly, even mainstream studies have criticised the claim that the exploitation of 'big data' makes *a-priori* theoretical hypotheses useless. They warn against 'big data hubris', i.e. the claim that big data are a substitute for traditional data collection and analysis: 'big data' may not be 'big insights' (*Buono et al., 2018*).

A conventional argument in mainstream economics justifying modelling is that the reduction of the complexity of reality to elementary variables of a mathematical model can be a epistemologically a valid representation of that reality, as famously justified by Friedman (*1953*). The justification of models by the fact that they constitute a 'as if' is also defended by philosophers of economics (*Hausman, 2015*).

Heterodox economists may also use sorts of 'as if', conceiving modelling as building surrogate devices that may have a heuristic value (*Mäki, 2009*). Yet heterodox economists are particularly aware that a key problem is to be sure of the elements of reality and detection of causalities that are contingent and can be omitted in the modelling. They are more exposed to remember that the 'as if' is not the thing, because reflections on epistemology – conditions of knowledge – and on methodology are important features of heterodox economics, and possibly among its cores.

From a philosophical perspective, 'scientific reductionism' may be a self-defeating form of scientism. It relies on a positivist view of scientific method, which is defined as the most rational way of thinking, the only method of verification recognised by positivism being mathematics, logic and the empirical sciences (*Cummings, 1998*). As shown by Putnam (*1981*), the criterion of 'scientific reductionism', for which only those statements that can be verified via scientific norms are rationally acceptable cannot itself be verified on the basis of such norms and is therefore not rationally acceptable. Putnam here highlights a standard problem in philosophy, i.e. no argument in support of a criterial conception of rationality can ever proceed on the basis of those criteria themselves – a wider notion of rationality is presupposed, and as underscored by Cummings, reductionism is at the root of this impossibility in providing a criterion of significance because the positivist methods of verification can never meet their *ceteris paribus* clause: in eliminating contingent conditions of an observation in order to keep only logical analysis, reductionism in fact can no longer be refuted by experience.

In addition, reduction is an operation that transforms concepts, which are nexuses of names, senses, references (as theorised by Gottlob Frege, *(1892/1960)*), denotations and connotations, and are situated in contexts - time and space: the removal of one of these elements modifies the concept – e.g., going from a mental state to an 'utility' to a variable and finally to a number. A concept is an abstract construct and 'is' not a thing perceived in the observable world: as is well-known, the concept of circle is not round, and that of dog does

not bark. A concept (e.g. the concept of being X) is not a class (e.g., of five X), and abstract context-dependent concepts may not form a class of representative exemplars (*Hacking, 2014*). Concepts therefore imply complex causalities, which may involve different sciences (including different social sciences), and reduction may not conserve these causalities. Reduction of a concept may be, e.g., in a metaphoric mode (representing something by something else) or a metonymic mode (representing a whole by a part, e.g., the 'representative agent'): in such a transformation, the meaning of what is represented may be fundamentally changed, as there is a fundamental uncertainty regarding what may be 'necessary' elements of a concept and what may be 'peripheral' or contingent elements. Establishing causalities between concepts is likewise threatened by reduction.

Moreover, it may even be argued that reduction is impossible, as any representation of reality is fundamentally context-dependent. In line with Wittgenstein (*1953*) or Kripke (*1972, 1982*), most concepts may be viewed as quasi-'proper names', with their reference being linked to specific time and space – and therefore not having the required property of stability and disambiguation for being modelled beyond specific and limited time intervals and geographical locations (e.g., 'money', 'right', 'democracy', etc, (*Sindzingre, 2017b*)).

Modelling

Modelling is not reduction, and modelling does not constitute a relevant distinction between the mainstream and heterodox paradigms. The issue is not the fact of modelling. As argued by Keen (*2015*), neoclassical mathematisation may not even be genuine mathematics, and there may be non-neoclassical economics that are mathematical. The issue of the poor quality of the mathematics used by mainstream economists has even been underscored by other mainstream economists, e.g. Romer (*2015*), who argued against the bad maths, or 'mathiness', of many mainstream studies. It is the modalities of the process of modelling that draw a distinction, and notably, it is the assumptions that may make the difference: for example, Post-Keynesian modelling rely on hypotheses that differ from mainstream macroeconomic models (*Lavoie, 2015*), e.g., they may assume the fundamental uncertainty of the world (*Lavoie, 2014*).

Complexity economics uses modelling, but the latter is utilised in a way opposed to reductionism, i.e. according to 'bottom-up' dynamics. For example, agent-based models are microstructures that model the behaviour of agents in a context, assign rules to units and observe the patterns that emerge with time (iterations) (*Elsner et al., 2015*) – even if one limitation is that these may only reflect the rules *ex ante* assigned to these units (*Sindzingre, 2018a*).

Rather, a core of a 'heterodox' reflection is that mathematisation has an epistemic status distinct from 'truth', and the epistemological reflection that a method cannot substitute for a conceptual content.

3.2. Time, irreversibility, uniqueness

Secondly, the conceptualisation of time may draw a line of difference between the two paradigms. Time is linked to space, as both contribute to the context of an event. Time is also a dimension of the above-discussed issue of causality and the possibility to model causalities, for example regarding the possibility to build 'stylised facts' that could be reproducible.

Conceptualising time

As are the issues of reduction or 'true' causalities, time is not a problematic issue for the 'model-platonism' that characterises mainstream economics (*Kapeller, 2013*), and mainstream models hypothesise the existence of equilibrium, homeostasis and time reversibility. This conception is unjustified, however, and closer to a 19th century view of mechanics than contemporary physics, though the latter is the science that mainstream economics has striven to imitate since this 19th century (*Mirowski, 1984; 1989*). Since the

early 20th century most physicists would defend a plurality of times depending on the level of reality considered. For some pioneering physicists, time and the perception of its flow do not correspond to physical reality. In particular, the popular study of Rovelli (*2018*) has thus argued that reality may rather be a network of events on which human beings project the past, present and future: the universe is organised by the laws of quantum mechanics and thermodynamics (entropy), and time emerges from these laws.

Philosophy has long argued that time could be conceived as a succession of unique events (as famously written by Heraclitus, 'no man ever steps in the same river twice'), and could be characterised by irreversibility. Heterodox economics has always been aware of the difficulties regarding the conception of time (and causality) that would be appropriate for economic analysis, and has taken into consideration the possibility of path dependence, non-ergodicity and irreversibility.

Cumulative causation and lock-in

These characteristics of phenomena and notably under the dimension of time have been theorised, in particular, by David (*1985*) and Arthur (*1994*). Economic causation can thus be of a cumulative nature (going back to *Allyn Young, 1928*, or *Nicholas Kaldor, 1981; Toner, 1999; Sindzingre, 2013*) and depend on past states: path dependence may be defined as a phenomenon that possesses the dynamic property of non-ergodicity in stochastic processes (i.e. not having the 'ability eventually to shake free from the influence of their past states') (*David, 2000*). Other concepts also describe these dynamics that simultaneously refer to time and causality, notably those of initial conditions, lock-in (e.g., by technological choices) and self-reinforcing mechanisms, positive feedbacks, tipping points, threshold effects, trapping processes, 'attractors'. Systems can be locked by 'historical small events' (*Arthur, 1989*); 'small causes' may produce bifurcations and unexpected events, including 'big effects', and rather than steady states, divergence may occur. The above concepts contributed to the conceptual matrix of complexity economics (*Arthur, 2013, 2014*).

Such concepts have clarified hypotheses made by heterodox frameworks, though some of them, such as multiple equilibria, increasing returns or path dependence, have been analysed by mainstream studies, notably those of poverty traps (*Azariadis* and *Stachurski, 2005; Matsuyama, 2009*) or of structural change (*Coniglio et al., 2018*, from the capabilities framework developed by Ricardo Hausmann and Dani Rodrik, e.g. *Hausmann et al., 2007*). For the post-Keynesian approach, for example, taking into account historical time is a more realistic assumption (closer to 'truth') than the assumptions of equilibrium, reversibility and homeostasis that characterise mainstream models –and taking history into account does not prevent the existence of time regularities, e.g. cycles (*Lang* and *Setterfield, 2006-7*, who endorse the Heraclitean view that 'we pass this way only once'). Likewise, path dependence (e.g. cumulative causation, lock-in, hysteresis) has an impact on equilibrium or fundamental uncertainty (*Setterfield, 2015*).

Similarly, heterodox thought gives a crucial importance to the concept of context, as the latter shapes, for example, the meanings and relevance of norms, in contrast with mainstream conceptions of the individual or policies as units that are 'detachable' from contexts (an assumption of experimental economics). For heterodox economics, initial conditions matter, as well as the temporal dynamics that follow them. Moreover, the societies of which economic agents are members are part of these initial conditions.

3.3. Links with other social sciences as an heterodox 'core'? The example of the links of the concept of norms with that of 'society'

Trying to conceive economics as a social science

Thirdly, for mainstream economics 'openness' to other social sciences is, in fact, conceived as a hierarchy, an absorption and eviction, according to an explicit 'imperialism' that is justified in the name of a superior 'scientificity' of mainstream economics vis-à-vis other

social sciences stemming from its use of mathematical modelling (*Lazear, 1999; Fourcade et al., 2015*). Yet in such annexation what is kept from the concept from the other social sciences is only what can be mathematised (*Sindzingre, 2017b*). Mathematising concepts from other social sciences, i.e. transforming them into variables that can be included in a mathematical model, change and may empty the meaning of the concept of that social science. Indeed, as any concept, the latter' meanings depend on its insertion within the nexus of other concepts built by that social science, and even more so as many concepts are made more complex due to their use by ordinary language (e.g. 'utility', 'interest', 'norm', 'individual', etc).

Behavioural economics is an example of a branch of mainstream economics that has been often presented as an example of the latter' 'openness' to other social sciences and even a departure from neoclassical assumptions. It may be argued, however, that behavioural economics rather represents the relaxing of some neoclassical assumptions, e.g. the inclusion of notions such as fairness or identity in the utility function. It may also be underscored that behavioural economics, in line with game theory (both sub-fields being closely related), still keeps the framework of methodological individualism: when behavioural economics claims that it takes into account other disciplines, the latter mainly consists in psychology (or neurology), which, even in its form of social psychology, keeps more a focus on the individual than society; when it claims that it takes into account social features, it rather refer, in fact, to the utility of individuals that depends on the behaviour and judgement of other individuals: as in games, the framework of methodological individualism is conserved.

In contrast, a commonality within 'heterodox' economics is that, despite the variety of approaches (from Marx to Veblen, Polanyi or Sraffa), it conceives economics as a social science, which tries to think social activities and social structures in their link with economic facts and behaviour (*Lee* and *Jo, 2011*). This constitutes a divergence from the evolution of mainstream economics after WWII and its use of concepts from social sciences: e.g., psychology (e.g., concepts of bias in rationality), political science (e.g., concepts of interest groups, elites), history (e.g., provision of long time series), sociology (e.g., concept of 'social capital), anthropology (e.g., concepts of 'institutions', social rules and norms). The difficult task of building economic concepts that would take into account 'social' dimensions as conceptualised by the other social sciences constitutes a theoretical core of heterodox economics. This has been, for example, the research agenda of 'founding fathers' of heterodox thinking such as Thorstein Veblen or Karl Polanyi. This was a commonality of 'old institutionalism' (Thorstein Veblen, John R. Commons), which borrowed concepts from social psychology of its time or from law and economics (*Rutherford, 2001*), and which put an emphasis on 'methodological collectivism' and 'socialisation' rather than methodological individualism and 'individuation' (*Samuels, 1990*). Equally, the concepts of heterogeneity in agents and their behaviour, as well as that of collective learning, which are developed by, e.g., agent-based models in contrast with the neoclassical representative agent, are a dimension of this commonality - trying to provide accurate accounts of the complexity of societies.

An example: the concept of social norms

The concept of social norms allows for a deepening of these points. The concepts of social norms and institutions have been fully integrated in mainstream economics after the so-called 'institutional turn' of the 1990s stemming from the prize the Bank of Sweden gave to Douglass North and Robert Fogel in 1993. Yet, though it has given rise to much debates and has been used to argue that mainstream economics opened to other social science (e.g., history, political science), what mainstream economics has kept from the concepts of norms and institutions are concepts that fit in the neoclassical framework (*Harris et al., 1995*). In particular, it may be argued that in its integration in mainstream economics the concept of norm (or 'rule', or 'institution') has been emptied from its dimensions involving society (or societies) – 'society' and not interactions of an individual with other individuals, an ontology

that is a core of behavioural economics, game theory, or principal-agent theories. Indeed, mainstream studies argue that they have long taken into account the role of social norms in individual behaviour. Yet these approaches remain within the framework of methodological individualism (e.g., in the studies of typical social norms such as those prevailing in non-market economies, kinship groups being analysed as capital market institutions, (*La Ferrara, 2003)* or in terms of strategic behaviour vis-à-vis kinship norms, (*La Ferrara, 2007)* or kinship systems evolving in order to enforce cooperation, Enke (*2017*). They leave unexplained why and how a social group can form from the juxtaposition of individuals, and why and through which mechanisms this meta-level (that of 'group') generates deontic beliefs that are able to impose norms of behaviour to members of this group, and moreover, their infinite variety.

Indeed, what mainstream economics has kept from the concept of social norms does not allow for an understanding of the concept of a society and the possible causalities the latter may have with the concept of individual, and in particular the pre-eminence of societies on the individual. Yet the latter is demonstrated by any careful analysis of social norms. This is already shown by evolution, where fitness in fact refers to that of kin groups (*Hamilton, 1963; 1964*). Equally, neurobiology has shown the existence in the human brain of neurons of 'empathy' for other humans ('mirror neurons', Preston and de Waal (*2002*), including in other social animals.

Norms typically involve cascades of cognitive processes, from names to mental representations and language (*Sindzingre, 2018a*). They also inherently involve social processes in that for norms to become more than private representations they have to disseminate – i.e. being considered as 'relevant' for oneself by more than one individual (*Sperber, 1996*).

For a norm to be relevant, a norm on that norm, i.e. a 'meta-norm', is necessary (a term that is used by game theory, e.g., Axelrod *(1986)*, for example via the concept of peer pressure, Fudenberg and Levine *(2016)*, yet within the methodological individualism framework of game theory). It is this 'meta-norm' that actualises an existing norm - political, religious, economic - and transforms it into a norm that an individual views as relevant for herself (as one of her many deontic mental representations). The key point is that these meta-norms are provided by a group: i.e. one of the many groups of which an individual, as soon she is born, is a member (whatever group it may be, including the group sharing the common norm that group membership is detestable…). An example may be the 'pressure' of a group for an individual to follow a given norm: the norm or institution (written or unwritten) may exists *ex ante*, but in all societies individuals may ignore it or choose not to comply with it: it is the pressure of a group that make it so that one individual complies with a norm (via whichever mechanism, mimicry, coercion, etc.). This pressure of a group may also be chosen by an individual - even if the apparent cost for that individual is high in terms of welfare, as shown by the innumerable examples in human history of sacrifices of life for the defence of a (representation of) the identity of a group (*Gomez et al., 2017*). For a norm to be followed by N individuals and to become therefore an observable economic fact, membership of a group is a necessary prior: by definition one does not follow the institutions or norms of a group one is not a member of, and conversely the common following of an identical norm generate a 'group'.

This membership is prior to the autonomous agent that is hypothesised by mainstream economics, and this conceptual framework where social groups appear to be conceptually prior to individuals may be viewed as a 'core' of a heterodox approach.

4. Conclusion

This article has explored the possible distinctions that may be highlighted between the 'mainstream' and 'heterodox' paradigms in economics, with the aim of isolating concepts and questions that could constitute theoretical 'cores' for the latter.

Firstly, it has shown the difficulties in defining and using the two expressions, and that many of the contrasts that are underscored in the literature are not unambiguous distinctions and that many conventional oppositions have in fact been blurred by the evolutions of both mainstream and heterodox economics, e.g. those related to methodological individualism, the selfish economic agent, modelling as a method or use of concepts of other social sciences.

In this context, in a second step, the article has demonstrated that three issues can distinguish the two paradigms and serve as foundations of theoretical 'cores' for heterodox economics: i.e. how to represent causality and model it; how to represent time; and how to represent the links between individuals and society – the latter have been analysed via the example of social norms, which confirm a representation of such links where social groups appear to be conceptually prior to individuals.

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