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The Challenge of Sustainable Development: From Technocracy to Democracy-Oriented Political Economics

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Abstract: Mainstream neoclassical economics, as well as heterodox schools, should be regarded as different kinds of 'political economics'. There is no value-free economics. We therefore need to bring democracy into economics. The present challenge of sustainable development suggests that a new conceptual framework in economics is needed. In this essay, a political and democratic view of individuals, organisations, decision-making, markets, assessment of investment projects and policy options is proposed. The imperative of democracy also implies that the close-to-monopoly position of neoclassical theory and method at university departments of economics has to be replaced by pluralism. There is a continued role for neoclassical theory and method, considering the fact that millions of professionals globally have been indoctrinated in this particular way of understanding efficiency and governance, but the idea that neoclassical theory is best for all purposes has to be abandoned.

Keywords: sustainable development, democracy, political economics, political economic person, ideological orientation, political economic organisation, mission, decision-making, matching, positional analysis, actor-network perspective.

Introduction

At university departments of economics in Sweden and elsewhere a technocracy-oriented paradigm, so-called neoclassical theory and method, is dominant. Neoclassical economists look upon their discipline as comparable to physics in its scientific approach. Markets are understood in terms of how the 'forces' of supply and demand lead to equilibrium and normative issues for firms, consumers and society at large are formulated with a focus on optimal solutions. In these two cases of an 'equilibrium approach' and in the search for optimality, mathematics is the preferred language. Economics then becomes a discipline where problems are formulated and 'solved' in mathematical terms, a language with its possibilities and but also limitations.

Neoclassical theory and method are clearly technocratic in their reliance on experts who are acquainted with equilibrium theory and who frame problems and deal with them in ways that can produce optimal outcomes. While there is a role for mathematics in economics, the almost exclusive reliance on mathematics by neoclassical economists can be questioned (Lawson, 2015). Quantification is certainly meaningful in many situations but the idea of limiting analysis to mathematical presentations while attributing a secondary or peripheral role to other ways of perceiving and understanding, is a mistake. In this essay I will however primarily focus on value issues. Can economics ever be neutral in value terms? Is mathematics a neutral language? Or should we instead open the door for value issues in economics and respect differences in ideological orientation among economists and other actors? Should there be openings for a democracy-oriented economics?

There are many signs of unsustainable development: possibilities of climate change, biodiversity loss, pollution (of water, air and soil), threats to the health of humans and increasing income inequalities are just some examples. In this essay an attempt will be made to bring democracy seriously into economics (Söderbaum and Brown, 2010). A conceptual framework is proposed that differs from mainstream economics in important respects. It is concluded that pluralism in economics is a necessary and important step towards a more sustainable future.

Gunnar Myrdal on Values in Economics

A basic assumption in this essay is that values and ideology are necessarily involved in economic theory and analysis. Already the choice of one paradigm or school of thought, such as neoclassical economics, over another, such as institutional economics, is an ideological and political choice. It is in part based on an actor's ideological orientation. In any study a number of decisions are made. Problems are framed or formulated and approached in specific ways amongst all possibilities, and values are involved in such choices. Gunnar Myrdal at an early stage demonstrated an interest in how values influence scholarly work (Myrdal, 1969). In an article entitled 'Institutional economics' in the *Journal of Economic Issues* he argues as follows:

'Valuations are always with us. Disinterested research there has never been and can never be. Prior to answers there must be questions. There can be no view except from a viewpoint. In the questions raised and the viewpoint chosen, valuations are implied.

Our valuations determine our approaches to a problem, the definition of our concepts, the choice of models, the selection of observations, the presentation of our conclusions – in fact the whole pursuit of a study from beginning to end' (Myrdal, 1978, p. 778).

Rather than arguing as in the above citation that our values 'determine' our approaches, I would say 'influence' our approaches. There are certainly other factors involved as well. In other parts I strongly support Myrdal's view about values in economics.

Another scholar, Tanja von Egan-Krieger, has examined mainstream, as well as different kinds of heterodox, literature in economics (institutional, feminist and ecological) in her book *Die Illusion wertfreier Ökonomie* (von Egan-Krieger, 2014). Her conclusion is that ideas about economics as value-neutral or about possibilities to distinguish normative statements from descriptive statements – are illusory. Even descriptive statements are based on some choice about what to describe.

We can safely conclude that economics should rightly be referred to as 'political economics'. Neoclassical economics is a kind of political economics and the same argument applies to other schools of thought in economics – including the kind of 'institutional ecological economics' that is emphasised in this essay. If one realises that no study of economics can claim to be apolitical then one is on the right path. And the kind of political element in any study is worth investigating and discussing.

The Concepts of Ideology and Ideological Orientation

If economics is political economics, as I have argued, then 'ideology' and similar concepts like 'worldview' or 'narrative' appear to be relevant. Politicians present their political agenda and refer to their 'ideology' while turning to us as citizens in a democratic society. When we as citizens respond to their messages in one way or other, we too refer to something that can be called ideology or 'ideological orientation'.

Not many economists refer to 'ideology' in their writings. A scholar who believes that we also need concepts at the level of perspectives is Douglass North. He uses the concept of ideology as follows:

'By ideology I mean the subjective perceptions (models theories) all people possess to explain the world around them. Whether at the microlevel of individual relationships or at the macrolevel of organized ideologies providing integrated explanations of the past and the present, such as communism or religions, the *theories* individuals construct are *colored* by normative views of how the world should be organized' (North, 1990, p. 23, emphasis in original).

Joan Robinson, another respected economist and social scientist refers to 'ideology' in her early book *Economic Philosophy* (1962). She also draws attention to differences in power between groups in society and points to a resemblance between the 'ruling ideology' in society and the ideology of mainstream economics:

'We must go around to find the roots of our own beliefs. In the general mass of notions and sentiments that make up an ideology those concerned with economic life play a large part, and economics itself (that is the subject as it is taught in universities and evening classes and pronounced upon in leading articles) has always been a vehicle for the ruling ideology of each period as well as partly a method for scientific investigation' (Robinson, 1962, p. 1).

Other terms similar to 'ideology' can be used. Mary E. Clark, a professor in conflict resolution, refers to 'worldview' (Clark, 2002, pp. 2-6). In her book *In Search of Human Nature*, worldview is described as 'constructed Gestalt'. While there is some diversity in perspectives, reference can be made to a 'western world view' that is dominant in large parts of the world:

'All human thought, all our knowledge ultimately is grounded in certain "givens" – certain inescapable beliefs and assumptions. On them we construct our model of reality or "truth" that allows us to function with confidence, more or less automatically' (Clark, 2002, p. 3).

Worldview is understood as follows:

'The beliefs and assumptions by which an individual makes sense of experience are hidden deep within the language and traditions of the surrounding society. They are the gestalt – the pilings, the vision of reality – on which rest the customs, the norms, and the institutions of a given culture. They are tacitly communicated through origin myths, narrative stories, linguistic metaphors, and cautionary tales. They set the grounds for a shared cultural meaning. These subconscious beliefs are sacred, a kind of religion or

faith. One's place in society, indeed often one's very survival, depends on accepting them. On top of those unconscious pilings are conscious traditions and institutions that form the normative map of behaviour which makes complex social life possible. Is it any wonder that we have such a powerful tendency to cling to them, to defend them, to find it painful in the extreme when they are threatened and we are forced to give them up and adopt new ones? Social change is not easy, especially when the changes are not superficial changes in our institutions, but profound ones touching upon our deepest beliefs' (Clark, 2002, p. 5).

Today, mainstream neoclassical ideas about economics are threatened and the challenges are profound rather than superficial. The ideas of progress in neoclassical theory and method (such as economic growth at the national level and profitability of firms) are, for some of us, regarded as an important part of the problems faced, rather than any solution.

An ideological orientation or worldview can be expressed as narratives or stories about problems and about progress for individuals, organisations, local or national communities and the global society. As an example, this is discussed at the level of cities in a book edited by James Throgmorton (2003). One advantage with the term 'narrative' is that perspectives are expressed in historical time. How can the present position be described for a city in terms of problems and opportunities? What are the desired future positions and how can means and ends be combined in strategies to get closer to desired positions in a near and more distant future?

The imperative of sustainable development as expressed, for example, in the 17 UN sustainable development goals (SDGs) (UN SDGs, accessed 10 January 2020) means that we are all faced with a challenge to our world views or ideological orientations. A way to be conscious about this and make room for some change is to think in terms of competing narratives or stories. What are the alternatives to the mainstream Western story about progress in society? The Western story line in terms of economic growth, income for consumers and profits in business has been convincing for many. A narrative emphasising sustainable development represents a main alternative (or set of alternatives) to conventional thinking. One conclusion is that democracy has to be strengthened in many circles for stories about sustainable development to be articulated and heard.

Stories told by mainstream economists – as experts in textbooks and elsewhere – tend to have a specific role in society as argued in the citation from Joan Robinson above. Is mainstream neoclassical economics supplying us with a useful conceptual orientation for sustainability? I believe that the neoclassical narratives at the levels of individuals, organisations, nations and globally – are not enough. As a first step we as economists need to accept a pluralist and democratic viewpoint.

To summarise this section, the concepts of ideological orientation (worldview) can be described in terms of narratives in positional terms where present position is linked to future positions in a means-ends relationship. An ideological orientation (worldview) then:

- is expressed in historical time;
- is not limited to quantitative terms but also includes qualitative forms (for example visual);
- is not limited to precise, all-inclusive presentations but often fragmentary and uncertain;
- represents a story with logical as well as value-related elements.

Economics Redefined

In neoclassical textbooks, economics is about 'allocation of scarce resources'. This emphasis on management or decision-making is not the only possibility of defining economics but will be retained here. In other respects, reference can be made to a new or modified definition. Economics is understood as:

'management of (limited) multidimensional resources in a democratic society'
(Söderbaum, 2018, pp. 12-22; 2019, pp. 22-24).

Why 'multidimensional' analysis? In neoclassical theory and method the emphasis is on the monetary resources and monetary aspects of other resources or impacts. As part of neoclassical Cost-Benefit Analysis (CBA) for example, an attempt is made to express all kinds of impacts in monetary terms to make them tradeable or exchangeable against each other. The new definition suggests that various non-monetary dimensions should be described and considered in their own terms and 'monetary reductionism' avoided.

When investments in infrastructure projects, such as roads or energy systems, are prepared, monetary or financial impacts should certainly be considered. But a focus almost exclusively on the monetary aspect may mean that many non-monetary impacts connected with the 17 UN SDGs are excluded or downplayed. Various forms of inertia, such as irreversibility, commitments, path-dependence need to be seriously taken into account. CO₂ emissions and other kinds of pollution are irreversible and the same is true of many land-use changes connected with construction projects (roads, houses, dams etc.).

Making 'democracy' part of the definition of economics relates directly to our previous thesis that 'valuations are always with us' in economic theory and analysis. We need concepts such as ideological orientation or worldview in economic analysis. Those concerned or affected by an issue, e.g. alternative investment projects, often differ with respect to ideological orientation. In a situation with different opinions about that which is best for society, economists cannot claim the right to dictate the optimum alternative. Conflicts of interest and differences of opinion is a normal situation in a democratic society. And such differences of knowledge and opinion mean that we can learn from each other. While CBA is a method with serious limitations, Positional Analysis (PA) will here be advocated as an alternative (Brown et al., 2017).

On the Purpose of Economics as a Science

The theory and method of neoclassical economics are ambitious in their attempts to explain how individuals behave as consumers and even how they should behave; 'All individuals as consumers purchase that combination of commodities which maximises their utility, subject to a financial budget constraint'. Similarly, it is assumed that 'All firms maximise their monetary profits' and that 'The forces of supply and demand gravitate towards equilibrium'. These kinds of general statements can be of some help in making us understand and predict the behaviour of sellers and buyers at the macro level. But general statements about all individuals and all firms or all markets have their limits and are specific in ideological terms. In relation to sustainability issues, for example, which is our main concern here, some actors in society may be more interested in how individuals as consumers differ from each other or how firms differ from each other. To make us understand how individual A as consumer differs from individual B as consumer, general statements about all individuals as consumers are of little interest. We need to approach each individual as actor in the market place or each

firm as actor. When approaching single individuals or single firms, a relevant and useful conceptual framework is needed. Ideally this conceptual framework or language should be understandable among various actors in the economy and society.

It is true that neoclassical 'public choice theory' has been proposed as an attempt to distinguish between actor categories in the economy (Olson, 1965). Farmers as a category are expected to work together (in a form of 'collective egoism') to increase their incomes much like other actor categories. But a closer look at farmers as a category may reveal that some of them are organic or ecological farmers while others are not (Söderbaum, 1991). Focusing on the category of organic (or conventional) farmers again will make us see differences between them that may be relevant for specific actors. It is this kind of 'closer look' at individuals in their different roles and on firms or corporations that is recommended in the present kind of institutional ecological economics. Among research methods so-called case studies are preferred to the testing of hypotheses concerning a large number of entities.

An Understanding of Individuals Compatible with Democracy

Neoclassical theory is built on well-known assumptions about the individual as Economic Man or *Homo Oeconomicus*. This person is related to markets and is searching optimal solutions when purchasing the best combination of commodities within her financial budget constraint. The individual focuses on self-interest while maximising utility.

An alternative in terms of a Political Economic Person (PEP) is proposed. The individual is regarded as 'an actor, disposing certain non-monetary and monetary resources, that is guided by her ideological orientation'. In her different roles (and in relation to each context) the individual is acting in a power position based on knowledge, experiences and other resources. This actor may still be focusing on self-interest but in the normal case a broader ideological orientation is expected where self-interest as well as interest or concern for others can be taken into account. The individual is not only a consumer or related to markets but also a citizen with a role in society and the economy. Our individual as a Political Economic Person may even take democracy and the future of ecosystems and our planet seriously. The ideological orientation of an individual is something to be investigated and respected, rather than taken as given.

A large part of human behaviour is habitual. The individual adapts or responds to a context which tends to appear repeatedly. But sometimes the individual faces options in the sense of alternatives with their respective expected impacts and decisions are made. In neoclassical theory and method such decision-making is seen as a matter of optimisation. A broader approach will here be recommended where calculation of 'optimal' consequences is regarded as a special case.

Decision-making is regarded here as a 'matching process' between – on the one hand an individual's ideological orientation, and on the other hand the expected multidimensional impact-profile of each alternative of choice considered. The ideological orientation of an actor as decision-maker can be precise or uncertain and fragmentary, and the same is true of the impact-profile. Some impacts may be estimated almost with certainty while other impacts are less clear.

The idea of 'matching' is used frequently these days, for example, when discussing the labour market. Single individuals as potential workers in various professions are matched against available jobs. Some attempts to combine the expected capability of an individual and a specific professional position suggest a 'good fit' while the expected results are less positive in other cases.

Rather than speaking about 'matching', reference can be made to 'appropriateness' (March, 1994). F. Schumacher once wrote a book *Small is Beautiful* (1974) where he referred to 'appropriate technology'. In computer language reference can be made to 'pattern recognition'. There is nowadays even an *International Journal of Pattern Recognition and Artificial Intelligence*. Satellites can be programmed to identify specific military constructions on the ground and report results of these search processes. But thinking in terms of pattern recognition can be understood more broadly and need not involve digital technology. It is also possible to refer to 'images' rather than patterns.

Understanding Organisations in a Democratic Society

The only organisation considered in neoclassical theory and method is the 'firm' which is assumed to maximise profits in monetary terms. The firm is essentially understood as a joint stock company with limited liabilities and this kind of organisation certainly plays an important role in the present political economic system. In neoclassical theory, however, other kinds of organisations active in the economy and society are excluded. We need a microeconomics where other organisations are taken seriously, for example: those connected with national and local government such as universities and other educational entities; social and health care organisations; as well as other organisations not primarily focusing on monetary impacts. The latter kind of organisation is sometimes referred to as belonging to a not-for-profit category. It is far from the real world to understand all organisations in monetary profit terms.

In relation to sustainable development there are organisations that focus directly on non-monetary objectives such as the survival of human beings on this planet. Greenpeace is an example. Today organisations of this kind are essential for many actors in the economy and society. To bring in such organisations we need to refer to ideological orientations or missions other than profit maximisation.

Even in the case of joint-stock companies there are good reasons to bring in broader views. Corporate Social Responsibility (CSR) and Fair-Trade are issues which are often dismissed as 'window-dressing' but may deserve further attention. Different actors may use the same words differently. In this essay a Political Economic Organisation (PEO) is proposed, i.e. an actor disposing of certain resources in multidimensional terms and guided by its mission (ideological orientation). In relation to sustainability, the size (and with it the power) of business corporations is a political issue – implying that the possibilities of national governments to regulate transnational corporations are limited. Sometimes it appears that transnational corporations control the national governments rather than the other way around. As an example, the corporation can minimise its taxes by manipulating its monetary profits in different countries.

Business corporations in general and transnational corporations in particular are political actors whose power and missions need to be examined (Wilks, 2013). We want to examine is if the business corporation as a legal entity fits well with sustainable development and democracy. This is discussed in David Korten's book *When Corporations Rule the World* (2001). A book by a leader of Greenpeace in Germany *Die Diktatur der Konzerne* (Bode, 2018) also deserves attention. Thilo Bode points in particular to the incompatibility between transnational corporations of the present kind and democracy. While business corporations and other organisations may have considerable power to influence developments in society, our Political Economic Organisation is not a monolithic entity. Many individuals as actors in different professional roles as well as owners and board members may influence policies and behaviour.

In his book *Theories of the Multinational Firm*, Mats Forsgren presents no less than six theories or ways of understanding multinational firms (Forsgren, 2017). I will not list or present all these theories but like to restate my beliefs in the fruitfulness of pluralism in economics and also that the choice between theories or models is not exclusively a matter of science. Also ideological orientation is involved. One of the models presented by Forsgren is 'the Networking Multinational'. When considering an alternative to the neoclassical firm we want something that is more in line with sustainable development and democracy, I suggest a political version of the network model. In this model, individuals and organisations are actors (PEPs and PEOs) guided by their ideological orientation or mission. They interact in relationships and networks which are of a market kind or more related to the larger society and democracy. Trust is essential for a functioning relationship and each actor is responsible and accountable in some sense.

While the borders between a firm and its context is assumed to be clear in the case of neoclassical theory, it is less clear in the present kind of political network theory. Actor A in one organisation with her (its) ideological orientation (mission) may in policies and behaviour be concerned about consequences for other actors in market and non-market networks. There is – in other words – a possible role for cooperation while the role of competition between clearly demarcated firms that plays such a dominant role in neoclassical theory is modified or downplayed. There can, however, be a kind of competition between networks of market actors and even including non-market actors.

When thinking in terms of networks, individuals and organisations are no longer so easily separable from each other. Market relationships are no longer a matter of the seller getting a high price in monetary terms and the buyer a low price. Seller and buyer may have interests in common and work together for mutual benefit. They may even work together to influence development in the larger community of actors or the larger society. Lobbyists may be hired to influence national government regulations, for example.

Understanding Markets in a Democratic Society

In neoclassical theory, markets are understood in terms of supply and demand as mechanistic forces. There are markets for commodities, labour and financial capital. This theory can be part of a pluralistic view of economics and certainly plays a role after many decades of economics education and indoctrination. Even in the present study orthodox theory plays a role but mainly as a point of reference when comparing different approaches in relation to specific purposes, such as sustainable development.

Markets can be understood in other ways. In his book *Markets. Perspectives from Economic and Social Theory*, William Jackson makes a distinction between four categories of approaches that differ from the orthodox view. These are social and cultural perspectives, structural, functional and finally ethical perspectives (Jackson, 2019).

In the present essay, I suggest a 'political version of network theory' as useful for the purpose of understanding markets in relation to sustainable development and democracy. We are back to the conceptual framework advocated above in relation to organisations. Concepts such as actor, role, ideological orientation, relationship, trust, cooperation, conflict, responsibility, accountability and other concepts from social psychology (perception, cognition, dissonance etc.) are potentially relevant.

Here, I will only elaborate upon one aspect of the proposed political version of economic theory. In neoclassical theory it is admitted that markets may fail in relation to actors outside the market transaction, so called third parties. This is referred to as external impacts or 'externalities'. A 'polluter pays principle' is then invoked to compensate for single

impacts on an identified third party and the value of this negative impact is quantified in monetary terms. This is, however, a reductionist view of possible damage outside the seller and buyer of a commodity. As argued by William Kapp (1972) what we are dealing with is not damage in a single dimension upon a single third party. Impacts outside the market transaction are multidimensional and ubiquitous. Kapp refers to 'cost' in a much broader sense:

'As an economist I have long held the view and continue to believe that the institutionalized system of decision-making in a market economy has a built-in tendency of disregarding those negative effects (e.g. air and water pollution) which are "external" to the decision-making unit. Thus, a system of decision-making operating in accordance with the principle for profit cannot be expected to proceed in any other way but to try to reduce its costs whenever possible by shifting them to the shoulders of others or to society at large' (Kapp, 1970, p. 18).

As we all know so called externalities may potentially affect large numbers of people and in some cases even the global society. This is another case where broader ideas of mission or ideological orientation are necessary. One of my colleagues among ecological economists, Herman Daly, refers to the 'Common Good' (Daly and Cobb, 1989). While this points in the right direction, we should in a democratic society realise that there are many ideas of a common good rather than just one. Indeed, there are competing ideological orientations.

Assessment of Investment Projects in a Democratic Society

In the present political economic system expected profitability in monetary terms is an important part of how investment projects are evaluated in business. But non-monetary impacts can also certainly play an important part in business decisions, for example concerning investment in technological research and development projects (Söderbaum, 1967) and democracy are also a potentially relevant aspects of business decisions. Broad approaches to decision-making are therefore relevant both for organisations of a profit and non-profit kind. When arguing here for Positional Analysis as an interdisciplinary approach, the emphasis will however be on public projects such as investments in energy systems, roads, railways, airports.

In neoclassical economics, Cost-Benefit Analysis (CBA) is the method advocated to evaluate public projects of the aforementioned kind. This method can be understood as an attempt to extend profit estimates in monetary terms to the public sector. Costs and benefits are estimated for future periods and for each one of the alternatives considered. Some costs (benefits) are of the monetary or financial kind, for example construction costs to build a new road. Other impacts are of a non-monetary kind. The idea in CBA is then to estimate the actual or a hypothetical market price (at the time of decision-making) of non-monetary impacts and aggregate all impacts in one-dimensional monetary terms. In this way the analyst is able to point to the best among the alternatives considered.

How is possible for neoclassical economists (and others) to argue that one single alternative is the best for society as a whole? By dictating how each and all impacts should be valued, it is assumed that there is a consensus in society about the CBA way of valuing impacts and that this is the only possibility. Ezra Mishan, himself a textbook writer on CBA (1971, and later, 1980) admitted that CBA is built on an assumed consensus about how to evaluate public projects in society and that it is no longer realistic to assume such a

consensus. He explicitly pointed to the increasing role of environmental issues in public dialogue where opinions differ considerably. There may be a consensus among a number of neoclassical economists as claimed experts in a technocratic sense, but that is far from the democracy-oriented perspective suggested in this essay.

Positional Analysis (PA) is a different approach. The idea is still one of systematically comparing alternatives of choice but PA builds on the previously-presented alternative definition of economics in terms of multidimensional analysis and compatibility with a democratic society. Positional Analysis is presented elsewhere (Brown et al., 2017). Here only the purpose of the method and some of its features will be indicated.

In a democratic society there are many political and ideological voices rather than one. To respect such differences analysis should be many-sided with respect to:

- ideological orientations;
- alternatives of choice considered;
- impacts in different dimensions.

While 'many-sidedness' is a key consideration, in practice one may need to limit the alternatives considered to three or four. Similarly, the number of ideological orientations can be reduced to three or four. The criterion of many-sidedness is meant to reduce possibilities of manipulation. Limiting analysis to only one ideological orientation, such as the one built into CBA, is a case of manipulation. Limiting analysis to one alternative of choice (or alternatives that are very similar) is a case of manipulation. Focusing on a single dimension is another example.

In a political assembly there may be a majority, an opposition and perhaps other minority views. For some politicians or decision-makers, the ideological orientation built into neoclassical economics (which is close to neoliberalism) is perhaps relevant and can therefore be articulated by the analyst. A ranking of the alternatives considered will follow. Another group of politicians or concerned citizens may take sustainability and sustainable development seriously. This leads very likely to a ranking of alternatives considered that differs from the ranking in the previous case. This in turn suggests that the results of Positional Analysis will be in the form of 'conditional conclusions' in relation to each ideological orientation considered.

While the purpose of CBA is to find one 'optimal' solution among available alternatives, the idea with positional analysis is rather to 'illuminate' an issue in a many-sided way for politicians and others concerned. Complexity is taken seriously rather than being assumed away (Söderbaum, 2020). The idea is that decision-makers should know what they are doing when choosing among the alternatives. It can also be argued that the analyst is modest in her claims rather than 'expert' in an extreme sense.

As the name of the approach indicates 'positional thinking' is a fundamental part of PA. In any planning situation there is an initial position in various dimensions, for example with respect to land use, pollution of water, soil, air or the health of human beings. How can each one of the alternatives considered influence future states or positions as measured by each indicator?

On the non-monetary side, various aspects of inertia, such as irreversibility, should be considered and 'illuminated' whenever possible. Decision-making is then regarded as a two-stage or multiple-stage process. Choosing one alternative today will close the door for some future options and open the door for other future moves. In this sense there are similarities with the decision making process in a game of chess.

Policy-Making in a Democratic Society

The neoclassical view of policy-making follows directly from its mechanistic view of individuals and firms in the economy and related positivistic ideas of value-neutrality. Criticising this view, Mary Clark refers to a 'billiard ball' metaphor (2002, pp. 6-8). The balls are like 'social atoms' that can be influenced from outside by the player, i.e. the national government. The monetary dimension is at the heart of neoclassical analysis, suggesting that individuals and firms can be governed by taxes and similar incentives.

An economy can certainly be affected by changes in monetary incentive systems. But belief in self-regulating markets may make the neoclassical economist reluctant to make tax reforms. There has to be an open attitude to competing ideological orientations. We are back to our political economic person and political economic organisation assumptions. Policy-making in a democratic society starts with the individual as the actor in her various roles. If the individual is guided by an ideological orientation, then policy-making has to include an analysis of differing and often incompatible ideological orientations. Sustainable development in the sense of the 17 SDGs sanctioned by the United Nations differs from ideas about economic growth and profits in business, made legitimate by neoclassical theory for example.

One of the roles of national governments is therefore to encourage individuals as citizens and as members of organisations to change their activities, behaviour and life-styles to become more in line with overall policies, such as sustainable development. Individuals can participate in public debate and refer to the freedoms of speech and other human rights. It is possible to cooperate in networks or organisations of actors that trust each other while working toward common goals.

Democracy is however not always about common goals. There may be more than one view about achieving sustainable development. Strength of a functioning democracy is that conflicts of interest become visible. This in turn may initiate further dialogue where media actors and university representatives can also be involved. And a 'many-sided' analysis may be carried out. As an example of involvement of the university, Edward Fullbrook has brought together no less than 20 heterodox economists to show what they have to offer in relation to the present climate crisis (Fullbrook and Morgan, eds, 2020). This is a scientific contribution but starts with a commitment to certain values rather than claiming value-neutrality. Freedom of speech, public dialogue and economic analysis that is compatible with democracy can in fact be regarded as part of a security system. Technocracy and political dictatorship in particular on the other hand, reduce the possibilities of early warnings and action.

Concluding Comments

While non-monetary positional thinking is an important part of the kind of institutional ecological economics emphasised in this paper, policy making as part of the neoclassical approach with CBA emphasises monetary thinking where all kinds of impacts can be 'traded' against each other. I believe that this 'monetary reductionism' and the monopoly of neoclassical economics in education and research more generally, are among the factors behind the present climate crisis and other failures in governance. In any case, I contend that it is time to open the door for institutional economics and other heterodox schools of thought in economics (Beker ed., 2020; Decker et al., eds, 2020).

'Democracy' is seldom discussed in mainstream economics textbooks. Perhaps mainstream economists regard democracy as being part of a different discipline such as political science or other social sciences more generally. But today we can observe how the respect for the constitutional rights of democracy are threatened in some parts of the world. I

believe that there are many reasons for us as economists to bring in democracy as an essential element of our analysis. And it should be added that democracy is an issue, not only in the larger society, but also among scholars in the university context. I have received useful and thought-provoking comments to an earlier version of my paper from two individuals, Rafael Galvao de Almeida and Jamie Morgan. A journal such as *Economic Thought* can add to the dialogue and contribute to a strengthened democracy. Among comments thus received I will conclude by pointing to possibilities to learn and unlearn in economics from the present 'climate urgency' emphasised by Jamie Morgan. Also the Covid-19 pandemic provides opportunities for us to take steps toward a more open and pluralist economics.

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Learning to Treat Our Natural World Realistically Through Unlearning Mainstream Economics?

A Commentary on the Recent Work of Peter Söderbaum

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Introduction: From Climate Emergency to Economics as Context

It is now well publicised that we have entered a period of recognised 'climate emergency' and ecological breakdown (Ripple et al., 2020, 2021; Morgan and Steffen, 2021).² Scarcely a day seems to pass without another reported event somewhere in the world linked to climate change: forest fires, storms, floods, droughts... And scarcely a week seems to pass without the publication of another dataset or report from the IPCC, UNEP, or one of many other UN agencies, government equivalent, research centre or NGO drawing attention to some significant metric: global greenhouse gas (GHG)³ emissions levels (typically in Gigatonnes carbon dioxide and equivalents or GtCO_{2e}), cumulative atmospheric emissions levels (typically as atmospheric CO₂ parts per million or ppm), average global temperatures, regional temperatures, glacier retreat, sea ice depletion, sea level rises, plastic accumulations, eutrophication effects, water table problems, soil depletions, desertification, loss of biodiversity and species extinction and so on. The direction of travel continues to be grim. For example, according to the 2020 UNEP 11th annual *Emissions Gap Report* global GHG emissions increased by 1.1% in 2019, excluding the effects of land use change (LUC) and 2.6% in 2019 if LUC is included, and this followed a 1.4% average annual increase (including LUC) for the whole decade (UNEP, 2020). Depending on how measured the emissions range extended in 2019 from 52.4 to 59.1 GtCO_{2e} but in each case was an annual record high for that category of measurement. In January 2021 the Copernicus Climate Change Service reported global average temperature in 2020 was 1.25 °C above the pre-industrial average and parts of the Arctic and northern Siberia reported 6 °C above a 30-year baseline average. In the same month the UK Met Office, forecast cumulative emissions in the atmosphere for 2021 to average 416.3 ppm (an annual increase of 2.29 ppm), varying above and below 417 ppm for the year (since during the growing season in each hemisphere ecosystems tend to absorb more CO₂ creating regional offsetting effects). 417 ppm is 50% higher than the pre-industrial level (late 18th century).⁴

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² The Alliance of World Scientists has been organised to coordinate pressure on governments and create public awareness of the urgency of the climate emergency. For example: Despite promising developments, the need for climate action has grown even more urgent this year - read 'The Climate Emergency: 2020 in Review': <https://bit.ly/3nk4QXt>

³ The Kyoto protocol defined the GHGs as: Carbon dioxide (CO₂), Methane (CH₄), Nitrous Oxide (N₂O), Hydro-fluorocarbons (HFC), Perfluorocarbons (PFC), Nitrogen Trifluoride (NF₃) and Sulphur Hexafluoride (SF₆).

⁴ This is not the first time ppm somewhere in the world exceeded 417 ppm. The claim is rather that the average will be persistently around this figure across the world and that 50% is a major milestone. Data is drawn from Mauna Loa Observatory in Hawaii which has the longest continuous records for atmospheric ppm, starting 1958. Previous estimates use analysis of air bubbles found in ice cores drawn from ice sheets. The late 18th-century level is estimated at 278 ppm.

The backdrop to these reports is now the Paris Agreement of 2015, which comes into full force in the present decade and behind this, energised by the IPCC *Global Warming of 1.5 °C* report (IPCC 2018), in turn, sets the new set of targets for net-zero emissions by mid-century and various targets to reduce emissions from the 2017 level by 45-55% by 2030. And *all* of this takes as its point of reference a carbon budget which links emissions levels and cumulative atmospheric emissions to likely climate effects (e.g. Steffen et al., 2018). Estimates vary, but most models place the total budget at the lower end of 3,000+ GtCO₂ to restrict warming to 2 °C and we have already emitted in excess of 2,000 GtCO₂. The 1.5 °C goal reduces the remaining budget still further, and the remaining budget may be as little as 238 to 349 GtCO₂ if we are to achieve this restriction to 1.5 °C (see Wildauer et al., 2020, p. 9). At current emissions rates we are clearly going to rapidly exceed this budget. Just GtCO₂ without equivalents was 42 in 2018 – hence the growing sense of emergency. To be clear, 1.5 °C may not seem like much but its significance is not as a locally experienced temperature effect (mere weather) but rather the fundamental effects on climate systems and patterns induced by this average change.

Carbon budgets, carbon footprints and many other related metrics are something we are likely all going to be required to become familiar with over the coming years. And it is now notable that governments and corporations have begun to acknowledge the need for urgent action. Most countries have signed up to Paris, the US has, of course, just recommitted, China has recently shifted its targets and the UN reports an increasing number of governments committing to net-zero by mid-century – the UN Climate Ambition Alliance is working to encourage countries to increase the ambition of their ‘nationally determined contributions’ to emissions reduction (NDCs) and has also launched the ‘Race to Zero’ campaign to feed this through to cities, regions, business and other actors.⁵ The growing prominence of ‘Green New Deal’ (GND) policy and investment programmes has begun to frame this apparent transition – for example, the EU is currently working towards a GND. In the language that has become the familiar parlance of global environmental and climate discourse, key actors seem to be finally waking up to the fact ‘business as usual’ is untenable. The pertinent question, however, is whether this constitutes an embryonic transformation.

Criticism of ‘business as usual’ is, of course, not new and nor are calls for action. The UNFCCC global framework to address emissions dates back to 1992 and concern began much earlier. In 2008 Clive Spash wrote:

‘Well, we’ve been here before. Major international political attention was first paid to climate change in 1988. At a meeting in Toronto, governments agreed to 20 percent cuts in CO₂ emissions by 2005. The same year, the Hamburg World Congress recommended 30 percent cuts by 2000 and 50 percent by 2015 (with some dissenters). However, instead of government action, we only saw the IPCC established to “study” the issue further. A decade later, Kyoto’s few percent emissions cuts for developed economies were still seeking ratification’ (Spash, 2008, p. 4).

The vast majority of countries eventually signed up to Kyoto, its subsequent expansion and/or related initiatives (beyond the ‘Annex Parties’) yet the 2019 UNEP ten-year assessment of the previous decade is stark – amounting to an admission that policy, of which there has been a great deal (through the Kyoto Protocols and their extension at Copenhagen 2009, Cancun 2010 and Doha 2012 etc.), had so far made little difference:

⁵ For the climate ambition alliance see: <https://cop25.mma.gob.cl/en/climate-ambition-alliance/>
Visit Race to zero at: <https://unfccc.int/climate-action/race-to-zero-campaign> See also Appendix A.

'The current level of global GHG emissions is by now almost exactly at the level of emissions projected for 2020 under the business-as-usual, or no-policy, scenarios used in the Emissions Gap Reports, which are based on the assumption that no new climate policies are put into place from 2005 onwards. In other words, essentially there has been no real change in the global emissions pathway in the last decade' (Christensen and Olhoff, 2019, p. 3).

The very need for urgent action at this time raises questions concerning the capacity and commitment of global organisations, countries and corporations to *really* address the causes of climate change and ecological breakdown. As the UNEP ten year assessment report goes on to say, 'The effects of climate policies have been too small to offset the impact of key drivers of emissions such as economic growth and population growth' (Christensen and Olhoff, 2019, p. 3). Clearly, there are fundamental issues to address in terms of unmaking futures we have set in motion and there are related issues in terms of unlearning theory that has informed policy and has affected public understanding of the nature of our economies, since this got us to where we are – i.e. a state of climate emergency, despite recognition years ago there were basic problems that needed to be solved. This brings us to the work of Peter Söderbaum.

Peter Söderbaum is professor emeritus in ecological economics at Mälardalen University, Sweden. He has been involved since the 1970s in developing an interdisciplinary curriculum for the purposes of sustainable development and his work marks him out as one of the early critics of mainstream economics' lack of due attention to an economy's ecological and climate consequences.⁶ Over the decades he has done a great deal to promote awareness of key issues and is particularly well-known for his critique of neoclassical economics' paradigm dominance. According to Söderbaum, the absence of pluralism in economics has consequences for the diversity and scope of democratic deliberation, narrowing these to the detriment of sustainable development, a term which he argues also needs careful scrutiny. Söderbaum has written many articles and a series of books exploring these and related issues (e.g. Söderbaum 2000; 2008; 2018[2016]). His most recent essay for *Economic Thought* (Söderbaum, 2021) provides an opportunity to address some of the underlying issues regarding the role of economics and of pluralism. In the following section I briefly set out his latest work in the context of his previous work and then move on to provide some elaboration on the core themes. Doing so will return us to the question of climate emergency and embryonic transformation.

Positional Analysis, Pluralism and Paradigm Co-existence

In his latest paper, 'The Challenge of Sustainable Development' Söderbaum reprises themes from his previous work.⁷ According to Söderbaum, neoclassical economics remains the dominant paradigm in economics and this is mainly what is taught in economics departments. This paradigm has key features. It is 'technocratic' and this is not just because it places great emphasis on mathematics and quantification, but because mathematics is typically used as though it were a 'neutral language'. Furthermore, its use tends to convey the impression that

⁶ Peter is interviewed by Malgorzata Dereniowska for the WEA Pedagogy Blog at: <https://weapedagogy.wordpress.com/2018/04/24/dialogos-economics-education-and-pedagogy-an-interview-with-peter-soderbaum/>

⁷ In what follows I have reduced, ordered and paraphrased Söderbaum's argument. This is necessarily a combination of selection and embellishment. Söderbaum may, of course, contest how his work is represented, but I would note this was done with constructive intent.

its derived output has objective truth content, rather than are conditional truth claims with an underlying set of value orientations that infuse neoclassical economics as one among many potential perspectives. The consequence of this is that neoclassical economics' theoretical framework tends to become *the* framing of how the world is and should be (from an economic point of view) and its conceptual components tend to influence how problems are posed and how policy is expressed. Conceptual components, moreover, come in combinations. For example, theory is framed in terms of tendencies to an equilibrium, where some defined optimal state is achieved and problems are stated as deviations from this optimality, subject to further conceptual criteria such as forms of efficiency, degrees of failure etc. And, since this framing theorises and measures its parts based on monetary valuations it tends to define goals, express problems and identify policy in terms of monetary valuation in general. This is a highly restrictive perspective, but it is one that sits easily with the central role that corporate profitability and GDP measurement and targets play in contemporary (neoliberal) economic life.

Söderbaum, by contrast, is a longstanding ('institutional') advocate of ecological economics and whilst there is some diversity within ecological economics, a core commitment is that it is an error to focus only or predominantly on the quantification of processes of exchange value (prices, monetary costs, profits etc.). An economy is a material process involving resource and energy use, entropy and waste creation. Economies in aggregate constitute a collection of subsystems embedded in and dependent on, but able to effect, the complex processes which comprise an Earth system (aspects of the biosphere, climate etc.). As such, it is fundamentally important that the scale and intensity of economic activity is theorised and researched in terms of its consequences for that Earth system. If this is not done effectively then economics is unable to provide an adequate guide to sustainable development and instead unsustainable tendencies may be enabled and perpetuated to the detriment of both human well-being and the environment on which that well-being depends.

It is against the background of ecological economics (and I have elaborated slightly here) that Söderbaum suggests the 17 UN Sustainable Development Goals (SDGs) are compromised and techniques, tools and methods built around neoclassical economics are problematic. For example, the use of neoclassical Cost-Benefit Analysis is problematic as a way to expedite investment in infrastructure and to orient and facilitate mitigation and adaptation activity. This, in turn, illustrates the narrowing of perspective based on a technocratic approach. Ultimately neoclassical economics is not just narrow (conflating quantification with scientific status, despite that it pays little to no attention to the material processes of its primary object of study), it is an exclusionary paradigm and as such it has been antithetical to pluralism. According to Söderbaum, however, economics needs to become and remain pluralistic and this is for a variety of reasons. Since paradigms are value-laden then each constitutes a framework of ideas and these can be legitimately different regarding social goals, ways of organizing society and ways of living. As such, there can be a range of economic theory and this ought to be reflected in the teaching of economics. This, however, is compromised if we view paradigms in competition, with a view to converging on a single correct paradigm. Furthermore, since paradigms can encapsulate worldviews and operate as ideology it is important to both teach students that economics can be ideological and to expose students to multiple ideologies. This, in turn, allows economics to contribute to democratic deliberation within society. Moreover, this economic pluralism is compatible with the development of an institutional ecological economics as one way to contribute to sustainable development.

From the point of view of 'positional analysis' (PA) difference and disagreement are normal in a democratic society and argument and advocacy can lead to learning. Economics

can be a discipline that facilitates learning by both acknowledging its own diversity and by more adequately defining what it covers. So, for Söderbaum, from an institutional ecological point of view, economics is 'the management of (limited) multidimensional resources in a democratic society' and this multidimensional analysis embraces measurement of material processes (in order to create awareness of thresholds and irreversible effects on climate and ecological systems) but also non-monetary valuations in and of society – allowing one to move beyond an overwhelming focus on a circular flow of income as though the economy were a perpetual motion machine, and move beyond mechanistic measures of GDP. This more nuanced approach allows greater diversity of type and motivation to be attributed to active agents (individuals and organisations) in society. With this diversity in mind, he proposes basic concepts of 'Political Economic Persons' (PEPs) and of 'Political Economic Organisations' (PEOs). According to Söderbaum these concepts allow economics to both recognise the range of values and motives individuals and organisations might have, which affect their decision-making, but also to engage them constructively across that range, from consumption to more other-regarding community or citizen positions.

Söderbaum also suggests 'a "political version of network theory" as useful for the purpose of understanding markets in relation to sustainable development and democracy'. Network analysis enables mapping of roles, values, responsibility, current conflicts of interest, but also areas conducive to cooperation and trust building across the complexity of a market democratic society. Moreover, a network approach in conjunction with PEPs and PEOs opens up a broader more nuanced way to assess investment in and change to society to achieve sustainable development and, concomitantly, open up dialogue, since democracy itself and various agents do not always exhibit common goals even if they do ultimately share a real interest in a viable environment. For Söderbaum this paradigm-tolerant, pluralistic, value-recognising and nuanced approach is quite different than the current dominant neoclassical approach – with its calculative universal economic agent, its suppression of value-orientations, its overwhelming focus on monetary values, its mechanistic-technocratic policy influence and its undemocratic implications for decision-making. He concludes:

'I believe that this "monetary reductionism" and monopoly of neoclassical economics in education and research more generally, is among the factors behind the present climate crisis and other failures in governance. In any case I contend that it is time to open the door for institutional economics and other heterodox schools of thought in economics [... and] "Democracy" is seldom discussed in mainstream economics textbooks [...] I believe that there are many reasons for us as economists to bring in democracy as an essential element of our analysis' (Söderbaum, 2021).

Arising Issues and Elaborations

Pluralism is a basic commitment of much of non-mainstream economics and is often used to differentiate it from an 'orthodoxy' within the mainstream – since orthodoxy has quite different implications than a mere mainstream (see Fullbrook, 2008; Davis and Morgan, 2019). As such, Söderbaum's recent paper and his previous work sits comfortably with a whole array of similar works that follow a direction of travel i.e. critique of paradigm dominance; or at least, since not everyone is comfortable with the Kuhnian term and its implications, dominance of a single and highly disputable methodological-theoretical perspective at the heart of mainstream economics (e.g. Lawson, 2015; 2003; 1997; Dow, 2012; 1996). Söderbaum's version of this critique is, of course, informed by his institutional ecological economics and this

adds a significant additional dimension to his work. On the one hand, it places an important and otherwise under-appreciated perspective within the purview of economics. On the other, given the claims made by ecological economists for the ineluctability of that perspective, it raises critical questions for how ecological economics relates to the pluralism it is intended to contribute to. Any other school of thought is in effect required to establish it is compatible with the fundamental claims of ecological economics in so far as ecological economics binds the social world to the natural world (awkward though that term is). Ecological economics highlights the need for economies as subsystems to stay within the boundaries of the Earth System in which economy is embedded. Whilst there may be many considerations that influence deliberation regarding what kind of ecosystems we are prepared to live within, there is also the limit of liveable ecosystems and climate (and it is existential problems at this extreme that currently dominate in a climate emergency). What this suggests, and I by no means want to imply Söderbaum is unaware of this, is that there are basic issues regarding how pluralism *coheres* and how different theory and positions in economics and beyond economics are judged in relation to this. This is important in at least two fundamental ways.

First, Söderbaum sets out to modify economics to make it more constructive in its contribution to democratic deliberation in a market democracy. One aspect of this is to energise PEPs and PEOs to make better decisions. However, and again I by no means wish to imply Söderbaum is unaware of this (the point addresses the general reader), this invokes a fundamental dividing line in the political economy of ecological economics. To what degree can one be confident that PEPs and PEOs are able to recognise and overcome the limits of and problems created by the purposes, specific interests and incentives and motives of their positions, in so far as they are located in an economic *system* and whilst that system continues to exist? An economic system has characteristic features given to its parts by virtue of the powers and potentials of those parts, deriving from the organisation of those parts and has observable tendencies based on the mechanisms that are intrinsic to the overall organisation of the parts within that system.

Clearly, Söderbaum is not wrong to suggest that a more nuanced approach to the diversity within and across interests and actions for decision-making is valuable (no organisation is 'monolithic'). But as reference to neoliberalism suggests, one does not need to be a Marxist to recognise that a market democracy can also be designated as a capital accumulation system, otherwise known generically as capitalism. One does not need to be a Marxist to note that such a system involves the existence of corporations, the need to earn wages in existent employment types, pressure to consume both for identity purposes and to maintain aggregate demand, in turn, energising a credit dimension to the economy within a broader set of financial services as well as a development model built around the spread to new places and people of globalised industrial-consumption economies connected by long supply chains. One does not need to be a Marxist to recognise this is a *growth* system – in GDP terms and in material and energy use.

Of course, we (some of us) do in fact live, in the global North, in market democracies and so it is not just valid it is imperative that we recognise the need for democratic deliberation regarding possible solutions to climate emergency and ecological breakdown – in so far as we have power to effect change.⁸ But there is surely an additional issue (and hence political economy dividing line) regarding the compatibility between systemic tendencies and any likely solution to the climate and ecological problems inhering in that system. Depending

⁸ And I am not implying that deliberation is restricted to the global North, merely that the market democracies of the global North are deliberative locations (arguably one's with greater responsibility for the problems we currently experience even if they are not the only places where agency exists or markets etc.).

on where one sits on this issue determines whether one extends the idea of democratic deliberation from within market democracy to transformation of its underpinning system i.e. solutions that require some roles and powers not to exist in order to address the problem of systemic features and tendencies. If one takes this position then the political economy argument for democracy is more radical in its implications – will ‘we’ decide to follow this radical option is an open question, but it is not a neutral question, even if it depends on or is facilitated by, pluralism, since at the extreme (and this seems to be where we are now) it is determined by what the planet will bear not by what we alone prefer; though this is in the end an anthropocentric point, even if it is a claim that there is an objective-evidential issue, since the planet will not end if we become part of a latest mass extinction event.⁹

In any case, the point surely bears on the adequacy issue for signs of policy leading to ‘embryonic transformation’ we noted in the introduction. And this brings us to the second fundamental way one might consider how pluralism *coheres* and how different theory and positions in economics and beyond economics are judged in relation to this. What status are we to give to different theories etc. within economics as part of pluralism and how are we to teach students about these different theories etc? There is something of an unavoidable tension here for pluralism, but not one that undermines the case for pluralism. As previously intimated the case for pluralism is typically multiple: theory is limited and theory is fallible so it is not definite any given theory is entirely ‘wrong’, it may provide some insight under some description of the world; there can be several such theories none of which is entirely wrong and all of which offer some insight into some or all aspects of that world; the social world is ‘real’, yet is also constructed in a way that responds to our belief systems, purposes and actions and these can be variable, so theory is a way to test out different groups of values that underpin these to some purpose we can agree upon and make real through social design and implementable policy; given that several theories can offer insight into how things are and different theories can offer insight into how things can or could be, pluralism is a necessary feature of any social science discipline including economics and this has value both from a teaching point of view and a learning point of view – students ought to be left to make up their own minds and this, in turn, has a broader impact on the thinking of students as participatory citizens (it ideally helps make them more considered, critical and engaged participants).

However, the complicating feature here is that adequate teaching is not just plural in the sense of recognised diversity. Theory is not just diverse it has degrees of justification based on its assumptions, claims, omissions, and evidence, affecting its plausibility, persuasiveness, relevance and potential to be both effective on its own terms and affecting whether it is harmful when considered beyond those terms. So there is a question regarding how one conveys theory, which students are making their minds up about. This is a task fraught with dilemmas and complication and particularly so in the context of climate emergency and ecological breakdown. What is it *responsible* to teach and how would one teach it in a time of climate emergency and ecological breakdown? Again, and to labour the point, I am not suggesting Söderbaum is unaware of this – curricula and pedagogy are things he has thought about and written about for decades. I am suggesting that the reader ought to consider the further complications that pluralism must contend with.

For example, if economics is also ideology and education affects deliberation then the dominance of neoclassical economics has both served functions and had effects. This, of course, is intrinsic to critique of Cost Benefit Analysis and to Söderbaum’s comments (in the

⁹ For range of positions see, for example, Daly (2015, 1997, 1974), Hickel and Kallis (2020), Kallis et al. (2020), Hickel (2020), Kallis (2109), Fullbrook and Morgan (2019), Parrique et al (2019). For discussion see Daly and Morgan (2019), Nelson and Morgan (2020) and Keen and Morgan (2021), Morgan (2020b).

paper and in previous work) regarding the meaning of sustainable development (seeking to move it beyond oxymoron) and the problems of the 17 UN SDGs. But what this suggests is that the shift to pluralism contextualises the role and failure of neoclassical economics and this is different than teaching neoclassical economics as merely *one* theory amongst many. It is intrinsic to Söderbaum's advocacy that pluralism is a response to the lack of pluralism in the neoclassical framework, that neoclassical economics has either ignored or marginalised ecological issues (mainstream economics tends to assume that resource use, damage and cost and pricing effects will lead to investment and substitution, where induced technological responses will solve most problems, and any additional areas of failure can be delegated to a sub-discipline of environmental economics),¹⁰ and that it has had consequences because of its influence on public understanding and on policy – and if one puts this together with the panoply of policy that has been developed over previous decades, the specific claims made by prominent economists (e.g. concerning optimal warming, discount rates, marginal losses of future GDP as economies grow without real limits)¹¹ and the cumulative evidence on emissions, species extinctions, resource overuse etc. then one can reasonably suggest neoclassical economics has consistently understated the cumulative problems of our system of economic activity from a climate and ecological point of view and has consistently failed to adequately address those cumulative problems. It has, as such, been a source of complacency and delay (albeit not the only one e.g. Newell, 2021; Ford and Newell, 2021; Lamb et al., 2020; Newell and Taylor, 2020; Stevenson, 2020; Oreskes and Conway, 2010; Lakoff, 2010).

Presenting students with a contextualised account of neoclassical economics, therefore, is to present them with a positioned account of a position and this leads to a further dividing line in ecological economics that one ought to be aware of. To what degree does one teach neoclassical economics as a limited technical-theory toolkit, which can be augmented or completed by ecological economics insight and to what degree does one place it in a political economy context that focuses on its ideological problems i.e. its power in the world in relation to its problematic features? One can, of course, expose students to neoclassical economics and suggest both of these possibilities, inviting them to make up their own minds, but the issue is one that ecological economists themselves divide over and this too has significance for the way we think about 'embryonic transformation'. Should neoclassical economics be taught as a *learning* exercise or used as a cautionary tale of what we need to *unlearn* in order to solve our climate emergency and ecological crisis? Clearly, there is a great deal more to say here and Söderbaum's books provide one source which bears reading. There are, of course, many others across a range of views (e.g. Spash, 2017). However, the more urgent one considers our current situation then the more the emphasis seems to shift to unlearning. In any case, I find myself in agreement that non-mainstream economics – heterodoxy etc. – seems to be more conducive to pluralism and thus to the prospect of coherent ways forward and it seems worthwhile adding a few additional comments here regarding how economics is taught and what is taught.

How Economics is Taught

As noted, neoclassical theory and a related methodology (or if one prefers a core mainstream; Morgan 2016b; 2015b) has comprised a dominant paradigm. Moreover, that

¹⁰ For example, O'Neill (2007), Gills and Morgan (2020a, 2020b, 2000c).

¹¹ For example Nordhaus (1991, 1994) and for critique of IAMs and various associated methods – DICE etc. (see Keen 2020; Asefi-Najafabady et al., 2020; Dale, 2018; Hickel, 2018; Spash, 2002, pp. 153-183).

paradigm has not just been dominant it has exhibited features that tend to render it exclusionary, albeit this is typically a process of tacit selection and marginalisation of alternatives: it works around a core of concepts and operations that are typically taken as unquestioned points of departure and conflates science with quantification and modelling based on specific mathematical techniques (formal proofs of specific concepts, use of analytical statistics to test datasets in accordance with variables of interest etc.). The combination has enabled it to be universally applicable, flexible and diverse (in so far as diversity is limited by use of methods and degrees of departure from the most stringent versions of its concepts) and has ultimately been either non-falsifiable or able to insulate itself from any failures in a given empirical case. As such, a core mainstream has arrogated credentials as the most applicable, wide-ranging and successful social science, despite often being founded on distorting/impossible unrealistic assumptions, despite in some cases stating the obvious, banal or inane, despite that tests and discussion of technical merits of methods are often substituted for explanation, despite that tests at different times in different places can establish different direction and strengths of relations between variables within concepts whilst the intention is usually to establish only one, and despite that its focus on technical aspects internal to models as measurements often works to obscure or distract from the importance of real world cumulative tendencies.

Anyone familiar with economics will recognise the above features and will also be familiar with the way teaching and researching economics built around these features has gradually socialised economists to be less reflective regarding what it is that they do, which in turn helps to reinforce the consensus position (a situation of: *this is what science looks like, economics is a unique social science because it deals with data rich aspects of social activity...*). An underlying unity of the type described tends to select students for mathematical aptitude and tends to encourage translating the world into basic concepts and techniques that are then translated through the mathematics and with this comes a restrictive logic built around the basic assumptions and methods. Furthermore, the 'thinking like an economist' that this encourages is paralleled by a didactic approach to teaching – since the way of thinking can be quite alien and the main focus is grasping concepts through mathematical expression and this is conducive to approaches to teaching built around demonstration and confirmation (which in turn tends to restrict critique to discussion of the technical merits of variations on similar work). Whilst this approach has political economy implications it also tends to encourage economists to think of their science as non-political – an objective set of methods to which different predicates can be applied to explore social engineering potentials – more market, more state, more wages, more profits etc., etc. and yet it has tendencies to bias based on the intrinsic values that optimisation and efficiency in relation to large numbers (which becomes a stylised idea of competition) inculcate.

Critique of all of the above is, of course, not new. Heterodox economists, philosophers of economics and historians of economic thought, as well as sociologists have provided numerous descriptions and critiques of a core mainstream sociology of knowledge.¹² And the global financial crisis provoked renewed critique from both the mainstream and non-mainstream. The Institute for New Economic Thinking (INET) was formed, the Association for Heterodox Economics (AHE) and various other organisations called for curriculum reform, *Rethinking Economics* and *Reteaching Economics* were organised, Edward Fullbrook and others built on the success of the *Real-World Economics Review* to form the World Economics Association, which sponsors various teaching initiatives and the Curriculum Open-

¹² See, for example, Fourcade (2009, 2006); Fourcade and Healy (2007), Fourcade et al. (2015), Earle et al. (2017), Milonakis and Fine (2009), Davis and Morgan (2019), Syll and Morgan (2019) and Lawson and Morgan (2021).

access Resource in Economics (CORE) project was set up (with INET support) to develop new teaching resources with the aim of overcoming some of the key defects of standard economics textbooks (lack of real world focus, lack of attention to history of economic thought and to history of real economies, lack of pluralism, limits to critical thinking – since no one thinks of themselves as uncritical in the positive sense of that term, no more than they think of themselves as unintelligent, they are rather shaped in how they conceive of the process, etc.).

However, whilst curriculum reform has received considerable attention, pedagogy has received rather less – there has been general agreement that students ought to be encouraged to be more reflective and critical, and to appreciate more diverse sets of ideas and evidence, but relatively little consideration of how to achieve this through principles attached to teaching techniques (and as Andrew Mearman and others have often pointed out, little attention to what the purpose of education is supposed to be – what should be the balance between technical skill-based education for employment purposes, broad-based understanding to socialise well-informed and perhaps conformist citizens of the state, and more critical approaches that create possible adversarial agents of social change...).¹³ As Söderbaum's early and recent work makes clear though, this 'how' (and to what end) is of great importance in educating students to engage in democratic deliberation. Arguably, pluralist approaches to economics and heterodoxy within pluralism, are more sensitive to pedagogical nuance.¹⁴ For example, in 2014 I was invited by the editor of the *Royal Economics Society Newsletter* to respond to the CORE initiative on behalf of the AHE (of which I was then coordinator). In that response and in accordance with an ethos of 'giving students something to think about rather than telling them what to think', I suggested:

1. 'A boundary should be maintained between one's own position and what is conveyed to students regarding the existence of positions. To do otherwise is to conflate the end product of one's own judgment with teaching the process of judgement. The latter should always be the goal. There is no single way to achieve this but:
2. A teaching strategy or the use of material should not become an invitation to confirm. An invitation to confirm is not an earned agreement, it may be mere channelling for concordance. This principle applies also to technical material, since one should not confuse confirming a student has grasped a proof or a technique with an understanding of its place.
3. The context in which a body of substantive theory is presented is as important as the content.
4. It is as important to build space into the curriculum, as it is to build content into courses. This should not be conflated with simply timetabling in self-study based on a reading list. Genuine space is designed rather than simply bolted on as an additional period in which students are required to familiarise themselves with material. Genuine space builds in a capacity for considered responses to the material that one intended to convey, and as a corollary provides a place for creative responses to that material and for further

¹³ See, for example, Guizzo et al (2019), Mearman et al (2018a, 2018b), AHE (2014). For more general issues of neoliberal education see Giroux (2014) and Zuidhof (2014). In a UK context institutional context see: Office for Students (2018) 'Measures of Our Success.' Office for Students.

<https://www.officeforstudents.org.uk/about/measures-of-our-success/>
Advance HEA (2020) 'Equality in Higher Education Statistical Report 2020.' Advance HEA.
<https://www.advance-he.ac.uk/knowledge-hub/equality-higher-education-statistical-report-2020>

¹⁴ See for example, Decker et al. (20019), Jo et al. (2018), Lee and Cronin (2016), Madi and Reardon (2014).

exploration of the arising significance of that material, perhaps because of current events. It militates against any time-pressured academic feeling compelled to respond to a potentially relevant economic question based on genuine curiosity with the dispiriting reply “that’s not on the curriculum”. Such space should also allow for the response, “I don’t know but maybe we can consider the problem or find out”. The existence of space in the curriculum distributes responsibility for learning. It also reinforces a learning disposition in students because it actively demonstrates to them that their opinion matters, that their opinion can be developed, and that the study of economics can always be turned to matters of relevance to the economy’ (Morgan, 2014, pp. 17-18)

And:

‘The organic outcome of implementing these principles ought to be engaged students who are encouraged and supported in developing a range of skills, from the assimilation of information to directed critical analysis of theory and evidence and then imaginative, creative responses to that theory and evidence. Such students are disposed to be collaborative problem solvers for whom objectivity is a demonstrated value [in the sense of open-mindedness].

Of course, setting out pedagogic principles in this way typically invites accusations of condescension. No academic would claim to be anything other than committed to being a good and then better educator and no academic would claim anything other than this required also a focus on developing student skills based on teaching strategies. What I am inviting you to consider is the logic of these principles and the commitment. If drawing attention to them can invite accusations of condescension it is because they are in some sense uncontroversial. But this also means that open-ended contextualised teaching necessarily embraces pluralism in order to achieve its goals. Economics is a social science or study of an aspect of society, and so as a matter of inquiry into the economy requires one to range across history, philosophy and policy/politics. It would be pedagogically irresponsible in a social science to not invite students to ask what theory is and what theory is for, to not also invite them to consider the way responses to matters of theory, including the different motivating questions one can ask or goals one sets, can profoundly affect inquiry and policy. In so doing one also reveals economics to always be re- describable as political economy, not least because economics concerns competing descriptions, explanations, perspectives and visions of an economy and what it is for’ (Morgan, 2014, p. 18).

Clearly, the dilemma regarding how to position neoclassical economics for teaching purposes we discussed in the previous section – as learning or unlearning – invites some degree of tension in terms of these principles and considerations. There are basic decisions to make in terms of # 3 and with a view to how students reflect on ‘what theory is and what theory is for’. However, these dilemmas are not resolved if ignored, they are simply suppressed and whilst that is a problem at any time (in terms of the ethics of education) it is a particularly severe one if the issue is climate emergency (see Røpke, 2020; Reardon et al., 2018; Komlos, 2019). It remains the case, however, that pluralism seems to offer an appropriate background to any ‘earned agreement’ which might also encourage Söderbaum’s vision of engaged and deliberative social/political/economic agents – though clearly there are different positions on

where the ethics of climate and ecological awareness and activism leads (e.g. Spash, 2020b; 2018).

What Economics Teaches

As the 2019 UNEP ten year assessment of emissions gap reports quoted in the introduction highlights, over the decade or so since the last major set of events that placed pressure on mainstream economics (the GFC), climate and ecological problems have only worsened and we now find ourselves in a declared climate emergency. Civil society movements such as Extinction Rebellion and Stay Grounded have sprung up and existing NGOs such as Greenpeace have become more prominent. Yet mainstream economics remains more of an impediment than an adequate source of public understanding and policy. Curriculum reform remains as important now as it was at the time of the GFC. In 2014/2015 the curriculum guidelines for UK higher education – the Quality Assurance Agency (QAA) approved subject benchmarks – were revised and there was a concerted effort to influence these (with limited success) based on a more pluralist approach to the curriculum. At that time I suggested a set of propositions and these seem as relevant today as they did then. In Söderbaum's terms they might perhaps be taken as a positional claim from a 'PEP' on behalf of a given 'PEO' and in some ways parallel his suggested definition of economics as 'the management of (limited) multidimensional resources in a democratic society'. I again quote at length – since I cannot express these propositions more concisely than I did in the paper from 2015:

1. 'Economics is the study of social provisioning or the different ways in which psychological, social and material well-being are and can be achieved through an economy. An economy is a historical and dynamic entity and its construction necessarily involves institutions and an emergent political framework that fosters particular trajectories for that economy. An economy is embedded in an ecology and there are material limits to development that cannot be ignored and are central to the continued achievement of well-being. Deliberation is fundamental to informed decision making at a micro and macro level and so economics is also an ethical science. Economics is integral to political processes and so has implications for policy and for how citizens live. It is always also political economy.
2. In so far as economics is the study of the social provisioning process, its insights are based on different sets of theoretical commitments or emphases. There are then many different ways to approach an economic problem and many different ways to construct theory and pursue an economic investigation. Economics is therefore necessarily pluralistic. Historically it encompasses different schools of thought that consider economic problems from different points of view based on different foci, concerns and ultimate aims. Since economics is deliberative and economies can qualitatively change, then there is also an ongoing need to consider new kinds of theorisation to consider old problems in new ways, and new problems based on new insights. Economics is contested but this is not simply a data issue; it is also an issue of the consequences of the dynamics of different approaches to social provisioning. Pluralism is ultimately a commitment based on the recognized value for the vitality of the discipline of constructive engagement with different approaches to an economic problem. It is rooted in the complexity, contingency and malleability of social reality.

3. Social reality is an integrated whole and economics is one way of demarcating an aspect of that whole. Its insights ought then to cohere with those of other social sciences, and productive interchange between the disciplines is an important way each can both inform and temper the claims of the others. It is therefore important that economics considers the theories, critiques and methods of other disciplines rather than primarily transpose its modes of analysis onto the subjects of other disciplines. This is part of what it means to be effective in studying economic phenomena in their historical, political, social, institutional and international contexts.
4. A successful economics education produces well-informed, responsible and critically aware citizens able to contribute more effectively to deliberation regarding issues of social provisioning. It also produces more productive economic participants and effective economic analysts.
5. Economics is in the broad sense a realist science. It prioritises realism and relevance over precision. It recognizes that there are many methods that may provide insights into an economic problem. It recognizes that there are limits to the use of any given method. It recognizes that an effective economics education develops the ability of an economist to understand the limits and potentials of different methods and different ways of theorising. In so doing, it recognizes that the ability to construct theory, and evaluate and use methods, requires a framing context of critical awareness. That awareness necessarily requires all students to be versed in the history of economic thought and the progress of economic history. It is also enhanced by the reflexive skills provided by the philosophy of economics, including, for example, social ontology. Without these, model building, the use of given methods, and of quantitative and qualitative data can all too readily be misused' (Morgan, 2015a, pp. 535-536).

These propositions are, of course, contingent and contestable and some of them involve ongoing disputes that represent open issues for economics (e.g. philosophical issues regarding the adequacy of varieties of realist social ontology and different types of social construction, issues of method-use informed by methodology in relation to use of qualitative and quantitative techniques and the status of models). Moreover, the phrasing 'more productive economic participants' is one that requires particular consideration when combined with ecological economics in virtue of # 1. and this has become more of a recognised concern in recent years as more non-mainstream economists take an interest in ecological economics and the problems of growth systems become more evident (see Spash, 2020a; 2020c; Dale, 2012). The issue of growth returns us to the problem of 'embryonic transformation' and we conclude with this.

Conclusion: Educating *for* the Future?

I suggested in the introduction to this commentary that there are fundamental issues to address in terms of unmaking futures we have set in motion and there are related issues in terms of unlearning theory that has informed policy and has affected public understanding of the nature of our economies, since this got us to where we are – i.e. a state of climate emergency. It should now be clearer what those issues are. Peter Söderbaum's work has over the years helped to improve awareness of the limits of economics as currently theorised and taught, and his most recent work brings to the fore basic issues of coherence that any

pluralist approach to economics must recognise and ultimately address. These are not mere esoteric or academic issues, given the role economics plays in the world – how we address these issues speaks directly to whether and what role economics might play in any putative ‘embryonic transformation’. Yet the major dividing line remains one that has been central to ecological economics since its inception – the nature of a growth system. There is broad consensus amongst ecological economists that a growth system, targeting continual growth in GDP with associated growth in material and energy use, claims of decoupling and dematerialisation notwithstanding, is untenable and this needs to be clearer in any alternative to ‘business as usual’ (including progressive Green New Deal programmes).¹⁵ But dividing lines still exist over whether our economic system can be made compatible with this shift away from growth, as we currently understand it, and whether democratic deliberation means choosing a radically different socio-economic system i.e., whether there is a survivable version of capitalism. Capitalism is an accumulation system, it innovates through incentive structures that are monetary even if it is possible to measure non-monetary aspects of an economy as a material system. Smaller, steady-state economies seem to strike at the core mechanisms of capitalism as we know it. Moreover, any dispassionate look at the mechanisms of industrial-consumption must recognise that the system as-is serves the needs of a relatively small proportion of the population of the planet and yet still exceeds the renewable resources of the planet. The future of ‘development’ cannot, therefore, be one of dissemination and emulation, whatever ‘ideology’ might offer in this regard. This, of course, indicates that no responsible economics can isolate itself from engagement with *global* issues of fairness, justice and distribution – values are, as Söderbaum suggests, of vital significance. Still, if economics is to provide an education for the future it must recognise that there may be objective sets of facts that inform viable values that ensure we have a future. The facts are clear, the values, beyond pluralism, are not yet settled though important initiatives have begun (see Newell, 2021).

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¹⁵ Is, for example, the transition to electric vehicles compatible with Paris goals (e.g. Morgan, 2020a; 2016a); how might one approach just transitions and aviation (Stay Grounded, 2021), is there a role for more disruptive global approaches to carbon taxes (Morgan and Patomäki, 2021) and what difference does inequality make (e.g. Morgan, 2017).

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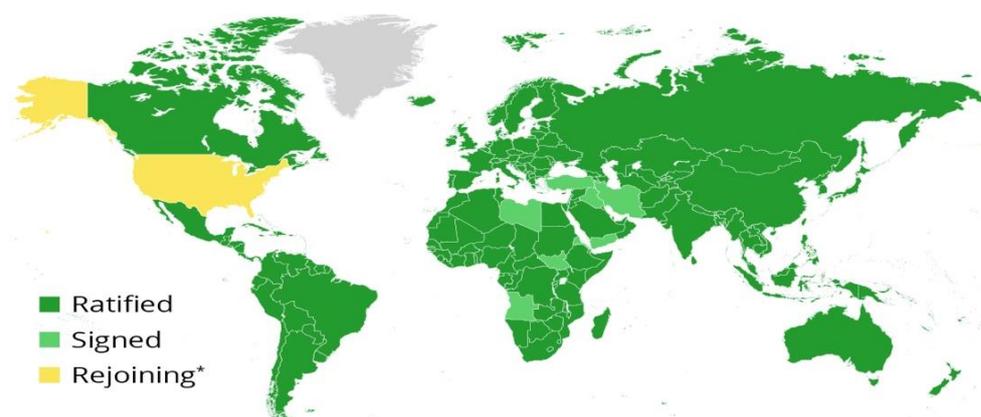
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Appendix A: Countries committed to the Paris Agreement

The State of the Paris Agreement

Countries by their participation in the Paris Agreement
(as of January 21, 2021)



* On January 20, 2021, President Biden informed the UN Secretary-General of the United States' return to the agreement effective February 19, 2021.

Source: UNFCC



statista

Available from: <https://www.statista.com/chart/9656/the-state-of-the-paris-agreement/>

Relevance of Chaos and Strange Attractors in the Samuelson-Hicks Oscillator

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Abstract: In this paper, we look for the relevance of chaos in the well-known Hicks-Samuelson's oscillator model investigating the endogenous fluctuations of the national income between two limits: full employment income and under-employment income. We compute the Lyapunov exponent, via Monte-Carlo simulations, to detect chaos in the evolution of the income between both limits. In the case of positive Lyapunov exponent and large values of the parameter (i.e. marginal propensity to consume and technical coefficient for capital), the evolution of income is seen to be chaotic. The model also may contain a quasi-periodic attractor that can be chaotic or not.

Keywords: chaos; attractor; oscillator; post-Keynesian; business fluctuations.

JEL Classification: C62; E12; E20; E32.

1. Introduction

The original linear model of accelerator-multiplier developed by P.A. Samuelson (1939) relies on a multiplier mechanism, which is based on a simple Keynesian consumption with a lag, and investment, depending on the variation in consumption (determined by the level of economic activity), which involves the accelerator mechanism. The combination of these two mechanisms gives rise to Samuelson's oscillator.

In his paper, Samuelson explains how multiplier and acceleration generate business cycles and fluctuations in national income. Before this paper, there are only marginal references regarding the role of both these principles in the theory of economic fluctuations. It was Harrod (1936, p. 33) who incorporated the interaction between them in the theory of trade cycles in an article that he published in 1936 in parallel with the famous Keynes' *General Theory*.

Samuelson models this interaction by choosing several values of the marginal propensity to consume and the marginal coefficient of capital. According to certain values of these parameters, the evolution of national income exhibits oscillations. These oscillations may be damped, perfectly regular, or explosive. Although this model contains some valid elements regarding the explication of economic fluctuations, it is not able to produce lasting business cycles. Moreover, empirically observed values of its coefficients imply that the trajectory of income is unstable (Westerhoff, 2006).

Thus, improving Samuelson's model, J.R. Hicks (1950) adds some changes by indicating that in a stationary state, induced – as well as the total net investment – must be nil, and gross investment must be equal to depreciation. Furthermore, he adds a floor (the under-employment income) and a ceiling (the full employment income) in this model and formulates a piecewise linear framework that can produce bounded oscillations. He also adds a geometric growth model that can be coupled with the business cycles. Some authors find that

“quasi-periodic attractors” can occur in the basic Hicks model and other authors investigate the mathematical properties of such a model (Gallegati, Gardini, Puu and Sushko, 2003).

In this paper, we show that, even though nonlinearity is a necessary (but not sufficient) condition for the occurrence of chaos in dynamical systems, the Samuelson-Hicks model displays chaos for plausible and widely used parameters values. Thus, we search the relevance of chaos characterised by quasi-periodic attractors by using Monte-Carlo simulation to estimate the Average Lyapunov Exponent whose value depends on the values of the marginal propensity to consume and the marginal coefficient of capital.

So, this paper contains the following sections. Section 2 provides a brief literature review of chaotic models. Moreover, it sheds light on the inclusion of such models in economics and particularly in the Samuelson-Hicks oscillator. Section 3 presents the original Samuelson-Hicks model and analyses the evolution of the national income between the floor and the ceiling. Section 4 exhibits the relevance of chaos by using Monte-Carlo simulation to estimate the Average Lyapunov Exponent, which is a useful tool for measuring chaos in the Samuelson-Hicks model. Section 5 indicates the possibility of the quasi-periodic attractor occurrence and makes a comparison between chaotic evolution and periodic, damped, or explosive oscillations of national income. Section 6 concludes.

2. Chaotic Model in the Samuelson-Hicks’s Oscillator: A Literature Review

Non-linearity in economics is relevant, which is why several researchers have included chaos in their analysis, most frequently employing endogenous fluctuation models such as the Samuelson-Hicks oscillator.

2.1. Chaotic Models: An Overview

Chaos theory is primarily used in the meteorology fields (Lorenz, 1960; 1972). The main insight behind this concept is that even a simple deterministic system can sometimes produce unpredictable situations – notably when such a deterministic system has a sensitivity to initial conditions in the short run.

Traditionally, chaos theory is analysed by means of a logistic function used as a simple model of biological growth (Baumol and Benhabib, 1989) such as:

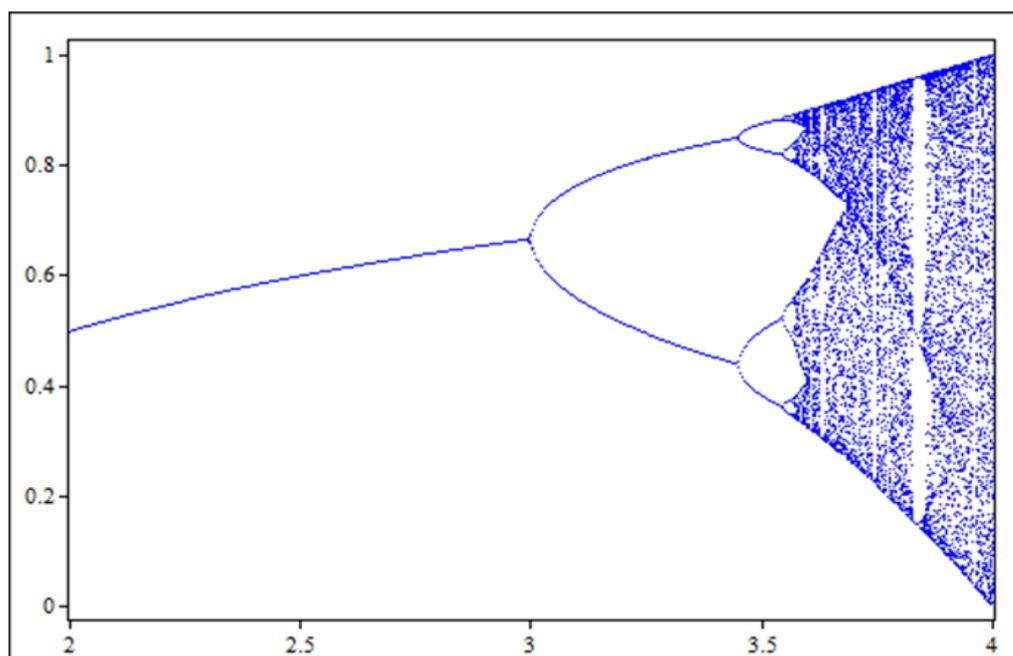
$$y_{t+1} = ay_t(1 - y_t) \text{ with } 0 < a < 4 \quad [1]$$

Figure 1, below, represents the evolution of the x variable (y -axis) as parameter a varies (x -axis).

This figure was shaped by simulating the evolution of the system over 10,000 iterations. It shows that if a system exhibits repeated periods of doubling then it will have an infinite number of bifurcations with a finite increase of that parameter (Feigenbaum, 1978).

For $0 \leq a \leq 1$, the stationary solution at the origin is stable and the system exhibits a cycle of period 1. If $1 \leq a \leq 3$, the stationary solution is stable but when $a = 3.1$, the system undergoes a bifurcation and presents a cycle of period 2. If $a > 3.1$ (and equal to around 3.5) the cycle of period 2 splits into a cycle of period 4. From $a = 3.57$ to 4, the system exhibits chaotic behaviour – except between the values ranging from about 3.82 to about 3.86, where a white window appears. This indicates that the system moves from chaos back into order, but it bifurcates again and returns to chaos at $a = 3.86$.

Figure 1. Evolution of the system as parameter a varies



In fact, as Faggini and Parziale (2014) point out, chaos means order without predictability and is not just an extension of standard economics.

2.2. Chaos in Economics and its Inclusion in Endogenous Fluctuations Models

Chaos constitutes a different way of seeing the economy, and the inclusion of this concept in economic analysis is not recent.

For example, Mandelbrot (1963) analyses the chaotic variation of speculative prices. Kesley (1988), using the overlapping generation model, asserts that economics models involve chaos. Baumol and Benhabib (1989) present nonlinear models as an example of chaos estimation.

More recently, Viad et al., (2010), taking an example of chaos in exchange rates, show that chaos theory is related to the notion of nonlinearity. Federici and Gandolfo (2014) propose various tests of chaotic behaviour in economics by also considering exchange rates. Other authors use chaos theory and the attractor approach to identify a chaotic dynamic in the evolution of GDP (Verne and Doueiry-Verne, 2019).

All these models are based on an econometric analysis taking into account the random factor via residuals of equations. However, chaos theory can also be used in endogenous fluctuations models that do not include the random factor.

The relevance of chaos in the endogenous fluctuations model was also discussed by Hommes (1995), Gallegati et al. (2003), Puu et al. (2005), and Piironen and Raghavendra (2019).

Hommes (1995, p. 436) analyses one of the simplest non-linear business cycle models introduced by Hicks by examining whether the path in Hicks's trade cycle model converges to a periodic time path every time. He extended the Hicks' model by considering lags in consumption and/or investment distributed over three time periods, and duly demonstrated the existence of quasi-periodic and strange attractors.

By referring to the dynamic of the multiplier-accelerator model, developed by Hommes (1995) and Piironen et al. (2019), we can show that the attractors exhibit periodic

behaviour intercepted by a sudden burst of erratic behaviour – which is pertinent for understanding regime shifts that we encounter in real economies.

In a more detailed investigation of the dynamics of Hicks' model, Gallegati et al., (2003) analyse bifurcations to study the conditions under which the model produces periodic and quasi-periodic dynamics. Thus, using certain values of the parameters composing the linear model of Samuelson-Hicks, the authors (Gallegati et al., 2003, p. 514) analyse a two-dimensional bifurcation diagram and show that an attractive cycle of some period, or a quasi-periodic trajectory, can occur.

Puu et al. (2005) revisited the original issue of growth oscillations using the relative deviations approach. The authors suggest a reformulation of the Samuelson-Hicks oscillator model by asserting that 'it is not only arbitrary to assume the floor to grow at the same rate as the autonomous expenditures, but the change even goes in wrong direction'. In fact, 'the floor would rather be decreasing with capital accumulation' (Puu et al., 2005, pp. 333-334).

Piironen and Raghavendra (2019, p. 3) reconsider the Samuelson multiplier-accelerator model by introducing a discontinuity in the investment expenditure, as in the case of Hicksian extension. As a result, such a modification yields new dynamics in terms of periodic orbits and non-periodic attractors. In addition, their model can generate bounded dynamics without needing to employ a floor and ceiling in the region where the system is deemed to be unstable, as in the original model by Samuelson.

For our purpose, we assume the existence of a floor and ceiling à la the Samuelson-Hicks oscillator and indicate the relevance of chaos by simulating several values of parameters of variables forming the model.

3. The Samuelson-Hicks Model

As we saw, Hicks improves the Samuelson model by adding the rate of growth to the variables, as well as the ceiling and floor.

3.1. The Original Samuelson Model

Samuelson's original paper (1939, p. 76), contains four macroeconomic variables: national income at time t ; Y_t which is itself the sum of three components: governmental expenditure, A_t ; consumption expenditure, C_t and private investment, I_t .

The first relationship between these four variables is an identity relation, as in the Keynesian tradition:

$$Y_t = C_t + I_t + A_t \quad [2]$$

In the Samuelson-Hicks model, investment is determined by the growth of income, through the principle of acceleration where investment is proportional to the rate of change in income:

$$I_t = k(Y_{t-1} - Y_{t-2}) \quad [3]$$

With k , the marginal coefficient of capital or the technical coefficient for capital e.g. the volume of capital needed to produce one unit of goods during one time period. Y_{t-1} and Y_{t-2} , are income of one and two periods back respectively.

The third relationship is about consumption expenditure function with the lagged income Y_{t-1} .

$$C_t = cY_{t-1} \quad [4]$$

With c , the marginal propensity to consume, we can write the national income as:

$$Y_t = (c + k)Y_{t-1} - kY_{t-2} + A_t \quad [5]$$

From this equation, we can estimate the evolution of income according to the values of marginal propensity to consume and the technical coefficient for capital. For example, for large values of c and k , the national income records explosive oscillations while it presents perfectly periodic fluctuations when $k = 1$ and $c = 0.5$. If the c and k parameters take certain values, we obtain the inverted complex roots from equation [5] written in a polynomial form:

$$Y_t[1 - (c + k)L + kL^2] = A_t \quad [6]$$

L is the lag operator where $L^k = Y_{t-k}$

Thus, in the case of oscillations, the determinant is $\Delta = (c + k)^2 - 4k < 0$ and $L = \frac{(c+k)}{2} \pm \frac{i\sqrt{\Delta}}{2}$

Setting $\frac{(c+k)}{2} = \alpha$ and $\frac{i\sqrt{\Delta}}{2} = \beta$, we calculate the modulus¹ $p = (\alpha^2 + \beta^2)^{0.5}$

In the Hicks model, the lower limit (the floor) is applied to induced investment while the upper limit (the ceiling) is applied to full employment (Gallegati, Gardini, Puu and Sushko, 2003, p. 508). In addition, Hicks models a growth process by introducing autonomous expenditures, which may be growing exponentially i.e. $A_t = A_0(1 + g)^t$ where g is a given growth rate and A_0 a positive constant. Therefore, the solution of the characteristic equation with complex roots is the product of exponential growth i.e. $Y_t = Y_0(1 + g)^t$.

By substituting the values of A_t and Y_t in [5] we define the stationary income and the two limits: the ceiling, e.g. the full employment income and the floor, the under-employment income where the induced investment is nil, and gross investment equals depreciation.

From equation [5] we can write:

$$Y_t = (c + k)Y_0(1 + g)^{t-1} - kY_0(1 + g)^{t-2} + A_0(1 + g)^t \quad [7]$$

¹ If $p < 1$, the values of inverted roots are inside the unit circle of the complex plane and income oscillations are damped. The process is stationary, and the national income returns towards its long-run value.

If $p > 1$, the values of inverted roots are outside the unit circle of the complex plane and income oscillations are explosive.

If $p = 1$, national income oscillations exhibit perfectly sinusoidal fluctuations.

By substituting $Y_t = Y_0(1 + g)^t$ in [7], we have:

$$Y_0(1+g)^t - (c+k)Y_0(1+g)^{t-1} + kY_0(1+g)^{t-2} = A_0(1+g)^t \quad [8]$$

And:

$$Y_0(1+g)^{t-2} [(1+g)^2 - (c+k)(1+g) + k] = A_0(1+g)^t \quad [9]$$

Finally, we obtain the stationary income or the equilibrium path:

$$Y_0 = \frac{A_0(1+g)^2}{[(1+g)^2 - (c+k)(1+g) + k]} \quad [10]$$

Equation [10] determines the equilibrium path around which the income Y_t may fluctuate.

In the Hicks model, we define the equilibrium growth path as:

$$Y_E = Y_0(1 + g)^t$$

When the technical coefficient for capital $k > 1$, the national income leaves the equilibrium path and inevitably reaches the ceiling of full employment for a maximum of two periods. Then, during the recession, national income falls to the floor.

The equation of the full employment output path is as follows: $YM_t = YM_0(1 + g)^t$.

YM_t is the full employment output at time t and YM_0 represents the full employment output at time 0 (e.g., the first term of the equation written in the form of geometric growth rate).

By substituting this term in the equation [5], we obtain:

$$YM_t = (c+k)YM_0(1+g)^{t-1} - kYM_0(1+g)^{t-2} + A_0(1+g)^t \quad [11]$$

In fact:

$$(c+k)YM_0(1+g)^{t-1} - kYM_0(1+g)^{t-2} + A_0(1+g)^t < YM_0(1+g)^t \quad [12]$$

Equation [12] is verified if:

$$YM_0 > Y_0 \text{ (computed in the relation [10])}.$$

After two periods, a change in the trajectory of national income occurs. It is the beginning of the recession phase where the induced investment disappears due to the decline in production. Hence, $k = 0$, and the relation [5] is simplified:

$$Y_t = cY_{t-1} + A_t \quad [13]$$

We define the under-employment output path (the floor) as $YL_t = YL_0(1 + g)^t$. By using this term in the equation [13], we obtain:

$$YL_0(1 + g)^t = c YL_0(1 + g)^{t-1} + A_0(1 + g)^t$$

By rearranging the terms, we have:

$$YL_0(1 + g)^{t-1}(1 - g - c) = A_0(1 + g)^t \tag{14}$$

Finally, we compute the under-employment income as follows:

$$YL_0 = \frac{A_0(1+g)}{1-g-c} \tag{15}$$

During the recession phase, Y_t falls to the under-employment level.

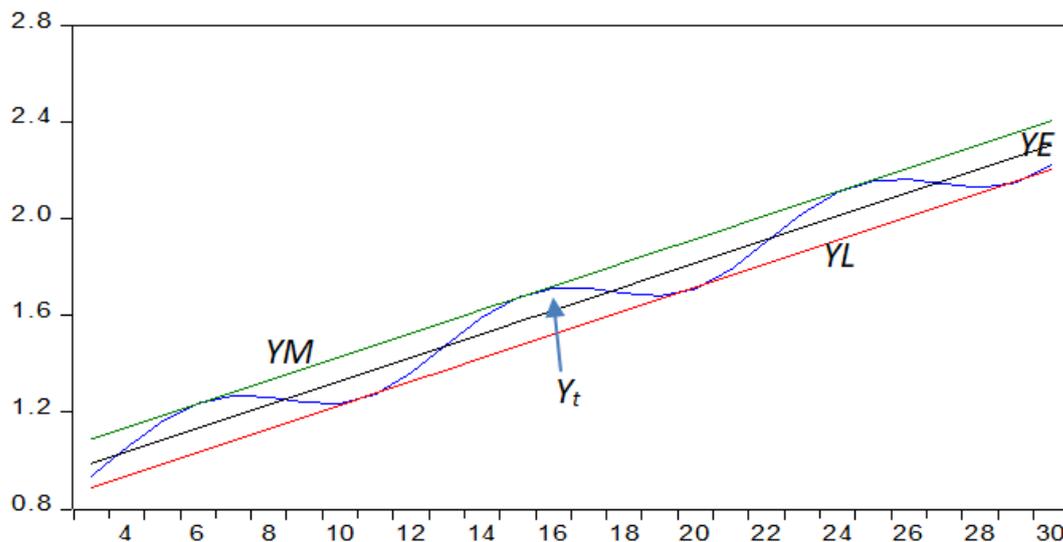
According to certain values of the marginal propensity to consume and the technical coefficient for capital, income displays several kinds of oscillations between both limits.

3.2. Evolution of Income Between Floor and Ceiling

In order to display the evolution of income between ceiling and floor, we assume several values for the technical coefficient for capital, k , and the marginal propensity to consume c . In addition, we take a period of 30 years and suppose that the economic growth rate is $g = 5\%$ per year.

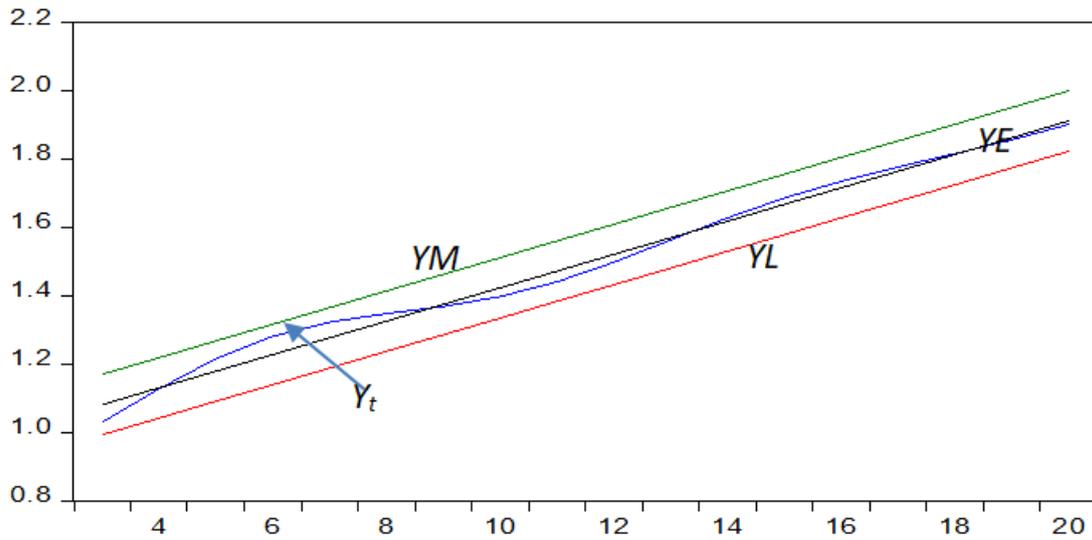
If we take the special case where $c = 0.5$ and $k = 1$, the evolution of income is seen to be perfectly sinusoidal between the two limits.

Figure 2. Sinusoidal Evolution of Income Between Ceiling and Floor



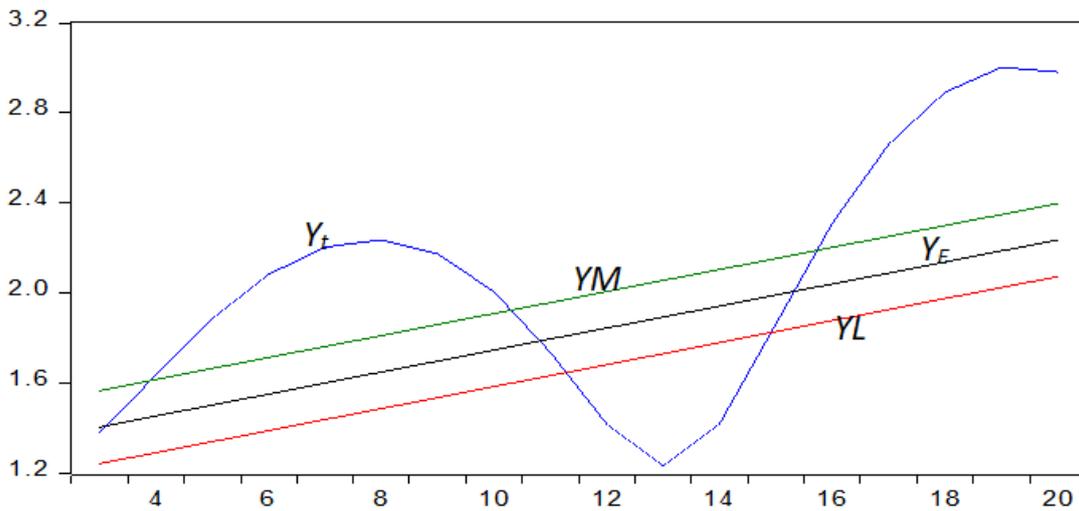
In the Hicks model, the economy is not stationary and exhibits a positive growth rate. As long as $c < 0.6$ and $k < 1$, the fluctuations of the national income Y_t remain inside both limits and are damped as Figure 3 displays.

Figure 3. Damped Fluctuations



For example, if $c = 0.6$ and $k = 0.8$, the fluctuations of income are damped (the national income is running towards its equilibrium value) and remain inside the corridor as long as the marginal propensity to consume is less than 0.6. However, when $c > 0.6$ and $k > 1$, oscillations in national income become explosive.

Figure 4. Explosive Fluctuations



For $c = 0.7$ and $k = 1.2$, explosive fluctuations of income are out of the upper and lower limits.

The Samuelson-Hicks model can exhibit chaos because it implies a second-order difference equation for output. This arises because investment is assumed to depend on the lagged change in output. The key mechanism highlighted by Samuelson is the accelerator effect, which arises because investment depends on the change in output. The assumption that investment depends on the lagged change in output is not essential; the accelerator effect also arises if investment depends on the current change in output. But in that case, chaos does not arise as output is a first-order difference equation, not second-order. Thus, only if the output is a second-order equation, can the occurrence and relevance of chaos be measured by the Lyapunov exponent – which is a useful tool for exhibiting the national

income trajectory between the floor and ceiling. Such a trajectory of national income depends on the values of capital coefficient (k) and marginal propensity to consume (c).

4. The Lyapunov Exponent: A Useful Tool for Measuring Chaos in the Samuelson-Hicks Model

The Lyapunov exponent can be seen as one of the most relevant tools for showing the occurrence of chaos in dynamical systems, as well as in time series related to economic or financial data. In our paper, we use such a tool for detecting the occurrence of chaos in the Samuelson-Hicks model. Thus, we carry out a Monte-Carlo simulation to analyse national income behaviour which depends on the simulated values of the coefficient for capital, k . This method enables us to mathematically determine the aperiodic fluctuations and strange attractors in the Samuelson-Hicks model. However, using the Lyapunov method allows us to describe the trajectory of a macroeconomic variable – but not specifically to reach an economic objective.

The Lyapunov exponent is the quantity that characterises the rate of separation of infinitesimally close trajectories. As mentioned before, it plays an important role in identifying the chaotic degree of the strange attractor (Wu and Baleanu, 2015). The number of Lyapunov exponents equals the number of state variables considered. If we consider a unidimensional system, like in our paper, we may compute one single exponent (Lopez-Jémines et al., 2002).

A *positive* Lyapunov exponent causes this separation to increase over further iterations and shows a chaotic dynamic. A *negative* Lyapunov exponent indicates an attracting fixed point or periodic cycle, and implies a non-chaotic dynamic characterised by a strange non-chaotic attractor. A Lyapunov exponent that is equal to zero displays sinusoidal oscillations and periodic attractor.

When searching chaos in the Hicks model, we use the Wolf method (1985) to estimate the Lyapunov exponent (called λ_t) using different values for the marginal propensity to consume c and the marginal coefficient of capital k .

By this method, we start from an initial condition Y_t in the Hicks model, and we consider a very close value of separation, where the initial distance d_0 is extremely small. The absolute value of d_t after t iteration is:

$$|d_t| = |d_0|e^{\lambda t} \tag{16}$$

It is equivalent to write:

$$\lambda_t = \lim_{t \rightarrow \infty} \frac{1}{t} \left| \frac{\partial d(t)}{\partial d_0} \right| \tag{17}$$

We choose the value of the separation $d_0 = 10^{-4}$ and obtain values of λ_t that give the values of the Lyapunov exponent. After a Monte Carlo simulation with 1000 random values of coefficient for capital, k (ranging from 0 to 4), we estimate the Average Lyapunov Exponent (ALE). Since chaos arises – as output is a second-order difference equation – the marginal propensity to consume (included in the first-order difference equation) is fixed. It takes several values (0.5, 0.6, and 0.8) in Samuelson’s original paper (1939, p. 77). We arbitrarily choose $c = 0.8$.

Figure 5. ALE evolution with respect to the coefficient for capital

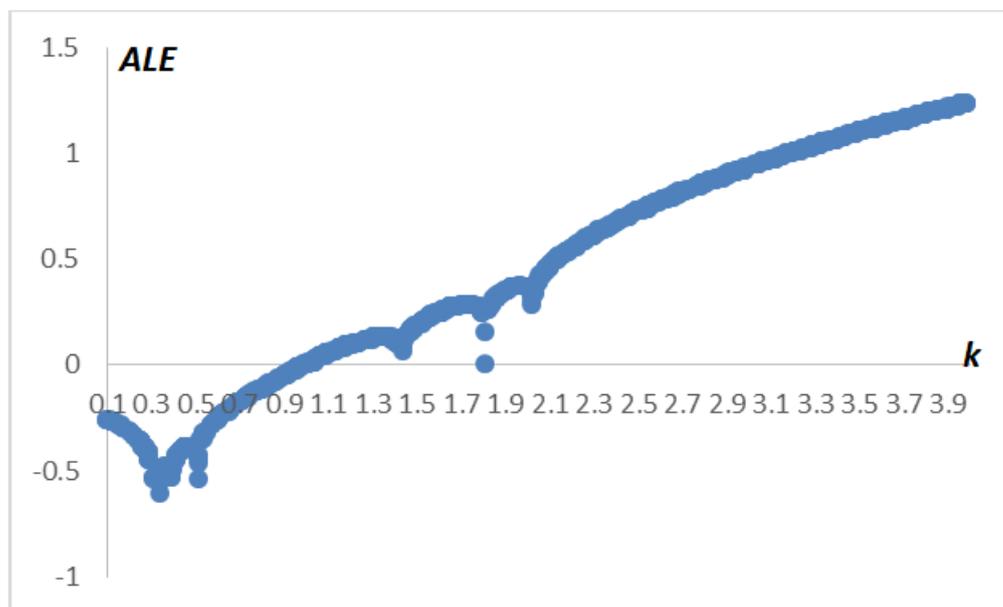


Figure 5 shows that the *ALE* is negative for $0 < k < 1$. This means that the behaviour of the national income (Y_t) exhibits a non-chaotic dynamic characterised by damped oscillations (stationary process with modulus $\rho < 1$). Then, if $k = 1$, the *ALE* is nil meaning that the national income fluctuations are sinusoidal (with the modulus $\rho = 1$). It becomes more relevant when $k > 1$. Thus, values in the region $k > 1$ are much more likely to lead to chaos. However, if $k = 1.8$, *ALE* = 0. This means that national income moves from chaos back into order for this particular value. But, in general, from $k > 1.5$ to $k = 4$, national income exhibits an increasingly chaotic dynamic (except for $k = 1.8$). In such a region, the oscillations are explosive and the Lyapunov exponent is strongly positive (with modulus $\rho > 1$).

According to the values of the technical coefficient for capital, which is the key parameter leading the national income to chaos, we can observe the occurrence of several attractors inside or outside both limits.

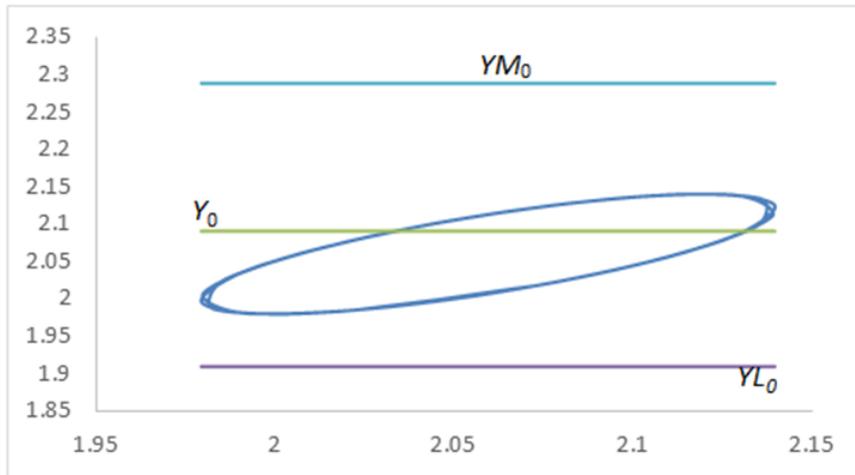
5. Quasi-periodic Attractors in the Hicks Model

Chaos theory involves the concept of the strange attractor for which the trajectories of a variable have a bizarre structure, being neither simple smooth, nor continuous curves but fractals (Puu, 1997). Fractals (Mandelbrot, 1982) could be an indefinite set of unconnected points, or a smooth curve with mathematical discontinuity, or a curve that is fully connected but discontinuous everywhere.

In fact, we have a quasi-periodic attractor when every trajectory winds around endlessly on a torus (Strogatz, 1994).

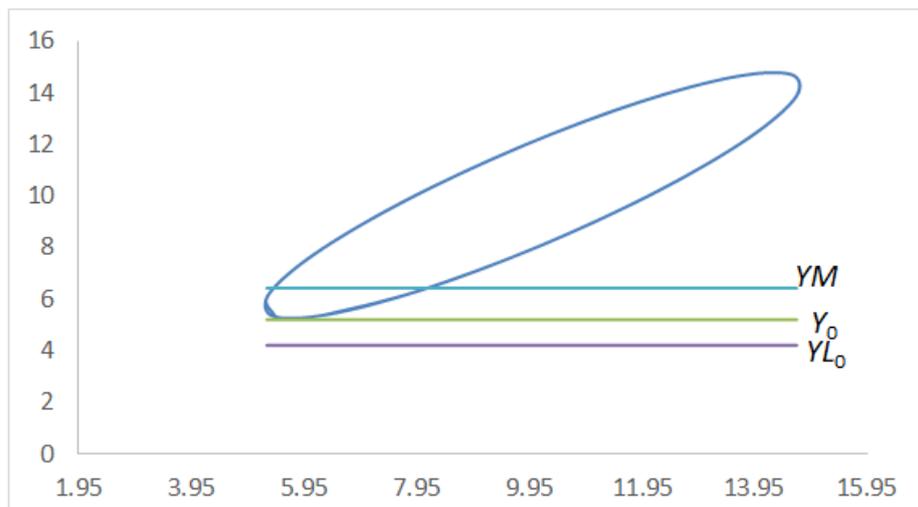
Thus, the following figures represent the strange attractor showing the national income evolution in the space phase where each ordered pair $(Y_t, Y_{t-1}; t = 2, \dots, N)$ is displayed in the plane (Figures 6a to d). The y-axis represents the values of Y_t and the x-axis, values of Y_{t-1} (Kriz, 2011). The three levels of income (equilibrium income, full employment income, and under-employment income) are represented as well.

Figure 6-a. National Income in the Space Phase: The Perfectly Periodic Attractor between the Two Limits



This Figure shows a perfectly periodic attractor between the upper limit (the income of full employment, called YM_0) and the lower limit (the income of under-employment, called YL_0). Thus, when $c = 0.5$ and $k = 1$, the modulus $\rho = 1$, and oscillations are perfectly sinusoidal. As a result, the periodic attractor is inside both limits. In addition, the Lyapunov exponent is nil meaning that a periodic attractor occurs. However, a rise in the propensity to consume (the coefficient of capital remaining equal to one), pushes the periodic attractor out of the upper limit (Figure 6-b).

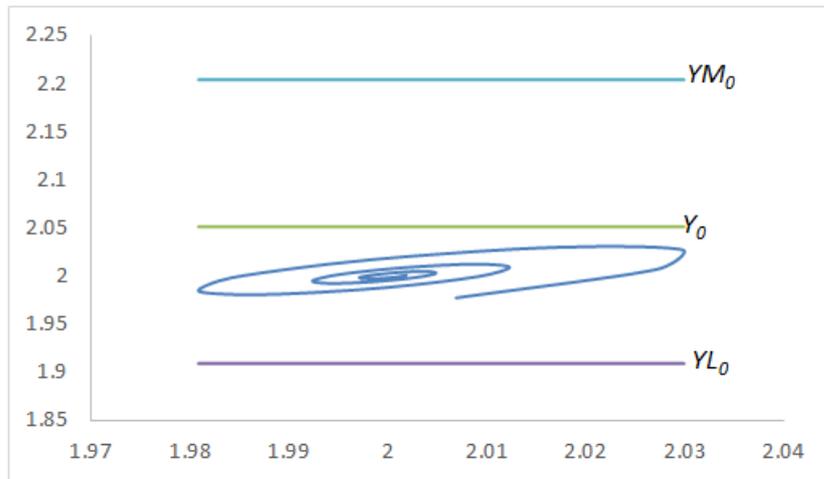
Figure 6-b. National Income in the Space Phase: The Perfectly Periodic Attractor out of the Upper Limit



This Figure exhibits the case where $c = 0.8$ and $k = 1$.

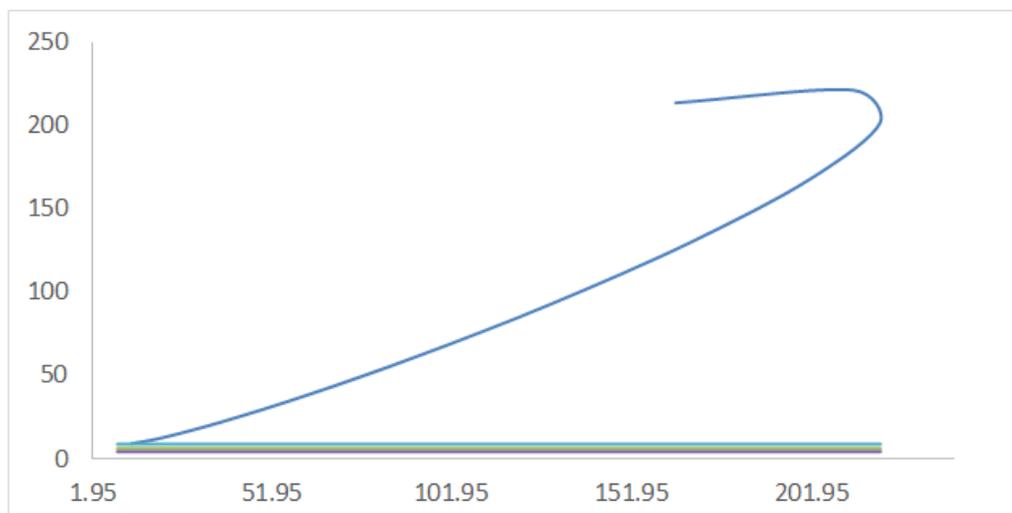
As long as $c \leq 0.5$ and $k = 1$, we have perfectly sinusoidal oscillations and periodic attractor inside both limits. But, if the technical coefficient for capital becomes less than one (with $c \leq 0.5$), the fluctuations are damped (the modulus $\rho < 1$), and the figure exhibits a strange non-chaotic attractor taking the form of an ellipsoid (Figure 6-c).

Figure 6-c. National Income in the Space Phase: The Occurrence of a Strange Non-Chaotic Attractor



This Figure shows that even though national income exhibits explosive fluctuations in the short run, a strange non-chaotic attractor does exist in the long run that pushes income to regain regular growth. In other words, national income enters the ellipsoid and then remains trapped therein for all future time (Hirsh, Smale and Devaney, 2004). However, when $c > 0.5$ and $k > 1$, the national income records explosive fluctuations and moves away from its trajectory (Figure 6-d).

Figure 6-d. National Income in the Space Phase: It Moves Out of its Trajectory



This figure shows the case where $c = 0.8$ and $k = 1.6$ and displays a chaotic strange attractor that goes beyond both limits. In this hypothesis, national income that starts far from the origin goes away from the ellipsoid and does not return to the equilibrium path. The trajectory of income moves away from the ellipsoid for all future time.

In addition, all figures exhibit a periodic or quasi-periodic attractor (that can be chaotic or not) when national income records oscillations e.g. when the determinant of the polynomial equation Δ is negative. On the contrary, if $\Delta > 0$ (when the parameters $c = 0.8$ and $k > 3$), the evolution of national income becomes explosive without oscillations and the quasi-periodic attractor disappears.

6. Conclusion

Economics can be seen as a complex system 'which evolves towards different attractors depending on the value of its parameters' and 'paves the way to the study of cyclic, non-periodic and chaotic behaviour' (Beker, 2014, p. 221).

In endogenous fluctuations models, such as Samuelson-Hicks, the oscillations of income move between two limits, e.g., the full employment income and under-employment income, depending on the values of the marginal propensity to consume and the technical coefficient for capital. However, the coefficient for capital is the key parameter explaining the relevance of chaos – as output is a second-order difference equation.

Furthermore, according to some values of the Average Lyapunov Exponent (*ALE*), a strange attractor exists and can be chaotic or not.

When the *ALE* is negative, the system has an attracting fixed point or periodic cycle characterised by a strange non-chaotic attractor localised between both limits. When the *ALE* is null, the system displays perfectly sinusoidal fluctuations inside the two limits and presents a perfectly periodic attractor. Chaos and explosive oscillations may occur with certain high values of the two parameters for which the determinant of the polynomial equation remains negative. In such a hypothesis, the *ALE* becomes positive, and the income moves out of equilibrium. Moreover, the attractor becomes chaotic and moves outside both limits. This means that in the Hicks-Samuelson model, the relevance of chaos depends on values taken by the coefficient for capital. For lower values, income oscillations are damped, and the attractor is between the two limits. In addition, the *ALE* is negative, and the strange attractor pushes income to regain regular growth. This illustrates a strange non-chaotic attractor where the income enters the ellipsoid.

The attractor and the oscillations disappear when the determinant of the polynomial equation is positive e.g. when the marginal propensity to consume and the coefficient of capital reach larger values than in the aforementioned case.

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Popperian Hayek or Hayekian Popper?

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Abstract: Friedrich Hayek was a fervent advocate of the methodological specificity of the social sciences. However, given his contact with Karl Popper, several historians and philosophers have characterised his final position as Popperian, that is, a position that would have accepted the unity of the scientific method. A closer look at Hayek's philosophy and Popper's own intellectual course shows that such a thesis is based on some misconceptions that can be overcome by taking the Hayekian concept of 'spontaneous order' as the foundation of a methodology immune to any kind of methodological monism, and focusing on Popper's late works that reveal a loosening of his defense of methodological unity.

JEL codes: B2, B3, B4

Keywords: Hayek, Popper, spontaneous order, methodological monism, social sciences

I. A Tale of Two Hayeks

Friedrich August von Hayek was one of the most fruitful minds of the twentieth century and undoubtedly the most prominent member of the Austrian School of Economics. In 1974, he was awarded the Nobel Prize in Economics in Memory of Alfred Nobel, and although the majority of his work focused on economics, he had multidisciplinary interests. Hayek wrote about philosophy, politics, law and even psychology. This multidisciplinary nature produced a long and complex output where the themes intertwine and form a unique fabric.

As for his methodological proposals, the Austrian remains in an eternal stalemate: everyone has a 'Hayek' to call his own. The more orthodox followers of von Mises trace a Hayek closer to that of his master's views and those of praxeology. On the other hand, some historians of ideas characterise Hayek through Popper, presenting his methodology as an appendage of Popperian falsificationism. However, his methodology is seldom studied in and of itself.

According to Gabriel J. Zanotti, Hayek instigated a Copernican revolution in economic theory and in the methodology of the social sciences (Zanotti, 2011, chapter 6), by refocusing the economic problem, from a resource problem to a problem of knowledge and information distribution. This goes unnoticed when Hayek is treated as a subordinate of von Mises or as a footnote to Popperian thought.

I intend, in this essay, to delineate Hayek's methodological dualism through the concept of 'spontaneous order', which I believe makes him immune to any pretension of scientific unity and thus immune to Popperian falsificationism.

II. Spontaneous Order: A New Methodology Begins

'The recognition of the insuperable limits to his knowledge ought indeed to teach the student of society a lesson of humility which should guard him against becoming an accomplice in men's fatal striving to control society – a striving which makes him not only a tyrant over his fellows, but which may well make him the destroyer of a civilization which no brain has designed but which has grown from the free efforts of millions of individuals' (Hayek, 1974, p. 34).

The problem of economic calculation was one of the most important debates of the first half of the twentieth century. It is during this debate that, in the face of Lange-Lerner's model, Hayek begins to elaborate his theory of the market as a spontaneous process and, in turn, the first sketches of what the Austrian would coin as a 'spontaneous order'. We can begin to chart the path to spontaneous order in 'Economics and Knowledge', where Hayek poses the following question:

'[...] how can the combination of fragments of knowledge existing in different minds bring about results which, if they were to be brought about deliberately, would require a knowledge on the part of the directing mind which no single person can possess?' (Hayek, 1937, p. 52).

Hayek was not the first to formulate this problem. Indeed, as he himself noted, this problem is part of a long tradition of thought which seeks a third way in the Greek distinction between natural and artificial phenomena, between *physei* and *thesei* (or *nomos*).¹ This essentially sophist distinction – and later adopted by Aristotle – begins to conceive two types of objects: it is a distinction 'between objects which existed independently and objects which were the results of human action, or between objects which arose independently of, and objects which arose as the result of, human design' (Hayek, 1973, p. 20). Hayek, and the preceding tradition, insists upon the need to devise an 'intermediate category of phenomena that were "the result of human action but not of human design"' (Hayek, 1973, p. 21). We are then in the presence of a sort of order – in the face of 'standards' or 'regularities' – but an unintended or non-designed order.² Hayek will use the Greek term *kosmos* – which designates (as opposed to the term *taxís*) any order that is formed independently of the human will – to speak of this kind of spontaneous social order. These processes, it is worth noting, do not presuppose in

¹ The natural/artificial dichotomy had already been denounced as insufficient by thinkers prior to Hayek. Adam Ferguson, for example, had already realised that there are institutions that are '...the result of human action but not of human design' (Hayek, 1973, p. 20). The roots of Hayekian thought are more deeply analysed in the article *Tradición del Orden Social Espontáneo: Adam Ferguson, David Hume y Adam Smith* (1987) by Ezequiel Gallo. The classical *physei/thesei* dichotomy was also rejected by the late Iberian scholastic tradition before the eighteenth century (the School of Salamanca - considered by Murray Rothbard, for example, as proto-Austrian (Rothbard, 1976, p. 71) - used the term *naturalis* to describe social phenomena that are not the result of a deliberate design, for example (Hayek, 1973, p. 20-21).

² The unintended nature of this type of order is linked to the theory of dispersed knowledge that Hayek begins to explore in *Economics and Knowledge* (1937). This, in turn, is anchored in the concept of *tacit knowledge*, coined by Michael Polanyi. For Hayek and Polanyi, all knowledge is personal and, since some knowledge is not articulable, 'we can know more than we tell' (Polanyi, 1966, p. 10). It is distinguished from *explicit knowledge*, then, because it is intuitive and disjointed (impossible to be codified) and is always generated through practical experience (it cannot be generated by logical deduction as *explicit knowledge*) and because it cannot be aggregated in one place or in one mind (that is, it is always personal and dependent on context) (Polanyi, 1962, chap. 2).

any way the notion of purpose or finality, since they don't refer to intelligent planning entities, which are contrary to the spontaneity of these processes.

According to Hayek, these spontaneous processes are the ultimate object of the social sciences. However, the novelty of Hayek does not lie in the assertion that the social sciences study spontaneous orders.³ Rather, it consists of the method proposed by the Austrian to approach them: the compositive method, which combines methodological subjectivism with methodological individualism.

Methodological subjectivism arises from the understanding that when studying spontaneous orders, social scientists are dealing with intentional objects – objects that are the product of human action. Thus, in order to be able to theoretically explain any such object, before building conjectures, social scientists must have behaved before as human agents. This is because a social object can only be scientifically understood insofar as social scientists are able to give it meaning and this is only possible if social scientists have already had contact with the set of phenomena that they intend to explain by means of theoretical models. Any social reality can be precisely objectified only by those who are able to understand it meaningfully for themselves. There is, then, a pre-theoretical relationship of the scientist with social institutions which represents a necessary condition for acquiring scientific knowledge about them.⁴

Methodological subjectivism emphasises the human factor: as Hayek makes clear, the objects of the social sciences cannot be defined independently of the purposes of human actions and what people think about the described object (Hayek, 1948, pp. 61-62). As we can understand through the example of Wittgenstein's wood-sellers (Wittgenstein, 1983, pp. 83-85), there is no way to enter into the mind of a third party in order to understand his or her preferences. Thus, it is quite possible that many acts that may seem to us to be examples of madness simply turn out to be an erroneous projection of preferences that we have made. A piece of metal, for example, may be currency or not, depending on the purpose for which people use it; paying millions of dollars for pigments scattered on pieces of cloth can be a perfectly rational economic behavior – depending on the preferences of the subject. It all depends on human action.

Social institutions are by no means natural: they exist insofar as a group of individuals interact, while participating in a given community of representations, which for the most part are acquired and unconsciously developed by its members through habits and traditions. Unlike an atomic particle or a process of genetic mutation, human institutions are historically constructed systems of beliefs and, above all, interrelated individual representations. However, the social scientist is not limited to studying these individual representations. Rather, he seeks to synthesise and model unobservable macro-objects through the

³ In one of his public commentaries on this paper, Professor Jack Birner noted that there is an important distinction between deterministic and indeterministic spontaneous-orders. My claim is that the main difference between natural and social sciences consists of the fact that the latter study spontaneous orders that are *indeterministic* spontaneous orders.

⁴ Hayek believes, as his lecture *The Primacy of the Abstract* makes clear, that any epistemological relationship always has a pre-theoretical element: the ability, even at the pre-scientific level, to unite isolated data under a common interpretive criterion implies a prior epistemological structure. To prove his point, he uses several examples: our innate capacity for linguistic articulation or, based on studies of animal behavior, patterns of behavior in animals that imply a series of innate dispositions of behavior that allow them very precise actions in specific circumstances (Hayek, 1978, pp. 37-42). Hayek notes his relation to Kant's categories because he affirms that there are some *a priori* categories, general and abstract, which are preconditions to the very interpretation of reality (Hayek, 1978, p. 45). However, his theory does not necessarily imply a formulation of *a priori* categories interpreted in a Kantian sense. The point drawn here is this: given the infinity of data to which we are exposed, a proto-theory is absolutely necessary for any kind of empirical observation.

observation of micro-objects: individuals. The social sciences construct models and theories of complex phenomena from simpler elements.

We then see the outline of Hayek's methodological individualism:

1. There is no direct observation: social scientists must have a pre-theoretical understanding of institutions in terms of their own personal actions as individual beings. Social phenomena can only be explained by interpreting the behaviours and beliefs of other agents in terms of their own.
2. Social phenomena are nothing more than results of human interaction, with most of the results being spontaneous and unspoken/desired.
3. Social institutions are processes of exchanging information between basic individual units and an isolated individual agent can never have all of this information. As Hayek sought to demonstrate from 1937, with 'Economics and Knowledge', there is no way to locate total information in a particular place of social structure because it is by definition always distributed among individual agents – and we may be standing before thousands or millions of agents. Social institutions must then be seen as products of spontaneous order that emerge from innumerable individual actions.

Thus, the compositive method must pass through an understanding ranging from the interactions between individuals to the general model of the spontaneous order in question. Hence, Hayek concludes, when we designate something as a market, we must know that this word simply designates the interaction of a group – of thousands or millions at times – of individuals. The market, the state or any other institution does not 'think' or 'act'. Only individuals think and act.⁵

Humility in The Face of Complexity

'Because our minds need to reduce information, we are more likely to try to squeeze a phenomenon into the Procrustean bed of a crisp and known category (amputating the unknown), rather than suspend categorization, and make it tangible' (Taleb, 2011, Postface)

In order to clarify the social scientist's task, Hayek draws an analogy with the work of the physicist:

'The physicist who wishes to understand the problems of the social sciences with the help of an analogy from his own field would have to imagine a world in which he knew by direct observation the inside of the atoms and had

⁵ However, as Gabriel Zannotti notes, there are processes that occur in spontaneous orders that cannot be predicated on particular individuals – using an example of his own, there are situations where it is 'the market' that saves resources, not an isolated individual. Zannotti argues that a universal term is not a collective term. A shoal is a set of fish, but each fish is not a shoal. But a universal term, as 'human being', is predicated of its individuals: João Pedro is a human being, Joana is a human being. What may occur in the social sciences is that collective terms are used to designate a certain interaction without, however, necessarily meaning an ontological collectivism. I can talk about this or that market, but the individuals who compose it are not themselves 'market'. One can speak of a process that is not intelligible, but rather a certain interaction of people. In this case, there are predicates that are specific to certain 'processes' or interactions, and other predicates are specific to people. We can say that a market 'establishes' prices, but in this case we refer to the result of the process (Zannotti, 2004, pp. 37-38).

neither the possibility of making experiments with lumps of matter nor the opportunity to observe more than the interactions of a comparatively few atoms during a limited period. From his knowledge of the different kinds of atoms he could build up models of all the various ways in which they could combine into larger units and make these models more and more closely reproduce all the features of the few instances in which he was able to observe more complex phenomena' (Hayek, 1942. p. 105).

This passage is illuminating because, in addition to synthesising the points described above, it shows how the object of the social sciences is essentially different from the object of the physical sciences. Hayek's analogy, however, not only tries to clarify the methodology of the social sciences, but also seeks to criticise those who try to apply the methodology of the physical sciences to the social sciences. Hayek will use the term *scientism* to describe such phenomenon – 'a slavish imitation of the method and language of Science' (Hayek, 1942, p. 80).⁶ More specifically, *scientism* is

'[...] a mechanical and uncritical application of habits of thought to fields different from those in which they have been formed. The *scientistic* as distinguished from the scientific view is not an unprejudiced but a very prejudiced approach which, before it has considered its subject, claims to know what is the most appropriate way of investigating it' (Hayek, 1942, p. 80).

With this sentence, Hayek describes what he believed to be the greatest mistake of the social scientists of his day: a fascination with the conquests and methods of the physical sciences which was embodied in a puerile attempt to apply it to the other areas of knowledge, ignoring all the characteristics of spontaneous orders and of social science itself. We can then understand *scientism* as the philosophical attitude of those who wish to adhere to methodological monism and who, according to the Austrian, are not prepared to take into account the fundamental differences of the social sciences. His Lecture to the memory of Alfred Nobel typifies his hostility towards the *scientist* attitude.⁷

According to Robert Nadeau, the central question is: 'as far as scientific knowledge is concerned, are those differences in objects to be interpreted as differences in degree or as differences in nature?' (Nadeau, 1987, pp. 2, 3.) As we have seen, in Hayek, the objects of the social sciences are essentially different from those of the physical sciences, and this occurs in the *function* of that very object of study in the social sciences: spontaneous orders. Therefore, we must always recognise that there is at least a difference of degree – which means that any association of Hayek with a philosophy that implies methodological monism is erroneous.

⁶ Michael Polanyi was particularly dissatisfied with Hayek's concept of *scientism*: '[...] what bothered Polanyi more was the tendency to tar all scientists and engineers with the same brush, accusing them of narrow technical training and a predilection for mechanical rationalist prediction and control' (Mirowski, 1998, p. 34). Polanyi's reaction is one of several examples of how this concept was misunderstood. With the term *scientism*, Hayek never intended to belittle the work or methodology of the physical sciences (about which, as he admits, he knew very little – and Popper will be influential in his view of them), he only condemned the attempt to transpose their method into the social sciences.

⁷ '[...] as a profession we have made a mess of things', says Hayek about the economists who had surrendered to *scientism*. 'It seems to me that this failure of the economists to guide policy more successfully is closely connected with their propensity to imitate as closely as possible the procedures of the brilliantly successful physical sciences – an attempt which in our field may lead to outright error' (Hayek, 1974, p. 23).

The analogy goes on to describe the experimental difficulties of the social sciences:

'But the laws of the macrocosm which he could derive from his knowledge of the microcosm would always remain "deductive"; they would, because of his limited knowledge of the data of the complex situation, scarcely ever enable him to predict the precise outcome of a particular situation; and he could never confirm them by controlled experiment – although they might be disproved by the observation of events which according to his theory are impossible' (Hayek, 1942, p. 105).

We find here a good summary of a proposal that Hayek began to suggest in *Monetary Theory and the Trade Cycle*. Here, Hayek demonstrates the limitations of empirical and static tests when applied to economic theory. The Austrian rejects the idea that econometric analysis can lead to the verification of a theory:

'It is therefore only in a negative sense that it is possible to verify theory by statistics. Either statistics can demonstrate that there are phenomena which the theory does not sufficiently explain, or it is unable to discover such phenomena. It cannot be expected to confirm the theory in a positive sense. The possibility is completely ruled out by what has been said above, since it would presuppose an assertion of necessary interconnections, such as statistics cannot make'⁸ (Hayek, 1933, pp. 34-35).

In *Scientism and the Study of Society*, Hayek advances a way of establishing models that cannot be 'confirmed', but only 'disproved' by the observation of phenomena that, according to the model, would be impossible: pattern predictions. Given the specificity of the phenomena that the social sciences are studying – spontaneous orders – they can only affirm general and negative tendencies because the potential counter-instances of such a model are singular and negative propositions.⁹

His proposal is best formulated from the 1950s onwards with *Degrees of Explanation* (1955) and *Theory of Complex Phenomena* (1964), when Hayek begins to distinguish between the simple phenomena – typical of physics, and the complex phenomena – typical of the social sciences. The Austrian begins by proposing a criterion for identifying the degree of complexity of a phenomenon. This criterion consists of a minimum number of elements that some specific occurrence of a pattern needs to possess in order to reproduce its characteristics (Hayek, 1969, pp. 25, 26). That is, the degree of complexity of an area of knowledge increases or decreases according to the minimum number of variables required for the reproduction of the patterns in question. Hayek believes that the increasing complexity of phenomena when we distance ourselves from the inanimate towards the more highly organised structures of the animate and social realm would be apparent – this is due to the human factor itself: the uncertainty inherent in the purposes of human actions and the intentional content, that is, what people think about the described object. Hayek's point is

⁸ Hayek, however, is skeptical about the possibility of making crucial experiments: 'It might be shown, for instance, by statistical investigation that a general rise in prices is followed by an expansion of production, and a general fall in prices by a diminution of production; but *this would not necessarily mean* that theory should regard the movement of price as an independent cause of movements of production. So long as a theory could explain the regular occurrence of this parallelism in any other way, *it could not be disproved by statistics*, even if it maintained that the connection between the two phenomena was of a precisely opposite nature' (Hayek, 1933, pp. 33-34, emphasis added).

⁹ For example, an 'All S is P' whose potential counterfeiter is 'some S is not P'.

proved by economists and social scientists themselves: in order to eliminate the complex character of their areas of research, apply a series of *ceteris paribus* assumptions without which the theory would cease to be simple.

The multiplicity of the minimum number of variables needed to explain a complex phenomenon makes it difficult to effectively determine all the initial conditions involved in the particular manifestation of the phenomenon in question. This difficulty, he concludes, translates into the practical impossibility of predicting the occurrence of specific events in these areas. The predictive capacity in the social sciences is restricted to the 'general characteristics of the events to be expected and not include the capacity of predicting particular individual events' (Hayek, 1974, p. 28). Scientific explanations are made with the help of modes and it is possible to construct models in the social sciences. However, the expectation of scientists of different areas in relation to these must be different. For the physician, for example, the value of a mathematical model consists of the fact that it is possible to change the values of the individual variables in the equations by numerical quantities (individual constants) and thus derive quantitative values of the events that are to be explained or predicted.¹⁰ On the other hand, scientists from other spheres would be unable to determine the values of some (or many) of the system variables, which rule out the possibility of predicting whether a given event will occur at a particular time and place.¹¹

With all these problems in mind, Hayek creates the concept of pattern predictions, necessary to the extent that one studies a situation of restriction that is evidenced when the scientist leaves a sphere dominated by phenomena of simple regularities, towards another governed by structures of complex regularities. These pattern predictions will mostly be negative, in the sense of telling us what facts should not occur, or otherwise, facts that cannot be verified simultaneously. Such theories will always be fruitful, since we can at least know what effects are related to each other and will appear connected, while we exclude other eventualities. These theories could be falsified – albeit to a much lesser degree than the physical sciences, given their lower empirical content as compared to those capable of providing predictions of specific events. Such theories, dedicated exclusively to the explanation and prediction of patterns of occurrence of complex type phenomena are called 'algebraic theories' (Hayek, 1969, pp. 28-29) – these would have as their most remarkable characteristic, in comparison with theories of the physical sciences, the impossibility of replacing by numerical values all the variables involved in their models, since our access to these magnitudes is quite restricted.

However, even with respect to pattern predictions, Hayek rejects the possibility of crucial experiments, on the one hand, by the nature of complex phenomena and, on the other, by the hermeneutical consequences of his methodological proposal.¹²

¹⁰ 'More particularly, what we regard as the field of physics may well be the totality of phenomena where the number of significantly connected variables of different kinds is sufficiently small to enable us to study them as if they formed a closed system for which we can observe and control all the determining facts...' (Hayek, 1969, pp. 3-4).

¹¹ 'The situation is different, however, where the number of significantly interdependent variables is very large and only some of them can in practice be individually observed. The position will here frequently be that if we already knew the relevant laws, we could predict that if several hundred specified factors had the values $x_1, x_2, x_3, \dots, x_n$, then there would always occur $y_1, y_2, y_3, \dots, y_n$. But in fact, all that our observation suggests may be that if x_1, x_2, x_3 , and x_4 , then there will occur either (y_1 and y_2) or (y_2 or y_3), or some similar situation – perhaps that if x_1, x_2, x_3 , and x_4 , then there will occur some y_1 and y_2 between which either the relation P or the relation Q will exist. There may be no possibility of getting beyond this means of observation because it may in practice be impossible to test all the possible combinations of the factors $x_1, x_2, x_3, \dots, x_n$ ' (Hayek, 1969, p. 8).

¹² About this point, Zanotti's work on Hayek's methodology is particularly elucidative because it allows us to understand such consequences through hermeneutics and phenomenology (Zanotti, 1999). A general model contains several assumptions that work as initial conditions in each specific case. The thesis that Hayek had advocated since *Economics and Knowledge* in 1935, that free markets tend to

'Because such theories are difficult to disprove, the elimination of inferior rival theories will be a slow affair, bound up closely with the argumentative skill and persuasiveness of those who employ them. There can be no crucial experiments which decide between them' (Hayek, 1969, p. 19).

III. Hayek: The Virtue of Consistency

'Popper's methodology and mine do not quite coincide, even though they share a lot ... I do not see at times if he is able to see to what degree his principles should be relativized in dealing with the [social] sciences' (Hayek interview in Madrid: Silva Moreira, 1994).

It is obviously impossible to reduce Hayek's methodological proposal to a dozen pages. My aim with the previous section is simply to show that we can have a better understanding of the Hayekian proposal through the concept of spontaneous order. The compositive method, the methodological dualism, the falsificationism, and all the other characteristics of Hayek's methodology, arise in the function of this peculiar object of study in the social sciences. Thus, by understanding the centrality of spontaneous orders in Hayek's thought, it is possible to conceive of a much more innovative and, above all, consistent thinker.

As I said in the first part of this article, Hayek's methodological proposals remain in an eternal stalemate where one conceives an excessively plastic Hayek, rendered to von Mises or to Popper, according to the phase of his life. T.W. Hutchison perfectly exemplifies this phenomenon by using the 'Economics and Knowledge' essay to draw a division between a Hayek I – a Misesian, and a Hayek II – a Popperian (Hutchison, 1992, pp. 57, 192). This opinion also appears in Norman Barry who, while recognizing 'a basic continuity in Hayek's writings on methodology' (Barry, 1979, p. 41), reiterates the idea that some kind of contradiction

'lies in Hayek's attempt to combine two rather different philosophies of social science; the Austrian praxeological school with its subjectivism and rejection of testability in favour of axiomatic reasoning, and the hypothetico-deductive approach of contemporary science with its emphasis on falsifiability and empirical content. This was not really a problem for Mises since he did not endorse the Popperian approach but it is something of a problem for Hayek' (Barry, 1979, p. 40).

Mark Blaug also states that Hayek 'has backtracked on much of his earlier opposition to methodological monism and now takes up a stance that is Popper-with-a-difference' (Blaug, 1992, p. 45).

equilibrium, starts from certain assumptions: free access to the market, absence of state intervention, absence of central bank, etc. Suppose such assumptions were met in 1929. Then, this question would arise: did the Great Depression happen because of or despite the free market? A supporter of Hayek would say that it happened despite the free market. But suppose he is intellectually honest and cannot find any evidence of it. So, somehow, he's being falsified. This, however, like any falsification, is not absolute. This would only mean that 'for now, my theory has a problem'. Such a situation happens with all the social sciences, since they all interpret, because the meaning of their theories depends on motivations attributed to the acting subjects. The social sciences work with human behaviour whose meaning depends on a motivation that defines them as such or as behaviour. Therefore, their corroborations or falsifications are hermeneutic and qualitative. Quantitative data only makes sense in the context of a global hermeneutics.

These are just a few examples of a vision that has been consolidating. But it suffers, in my opinion, from two mistakes. First, it assumes that Hayek was a Misesian or an advocate of praxeology as espoused by von Mises. Secondly, it reflects an erroneous analysis of the fruitful relationship between Hayek and Popper.

The first error, in addition to contradicting what Hayek himself stated,¹³ was already set out by John Gray in one of the earliest works on Hayek's philosophy, *Hayek on Liberty*. Gray notes that 'Hayek always differed from the Austrian School, especially as that was embodied in the person of von Mises' (Gray, 1984, p. 16). In addition, 'Hayek never accepted this apodictic–deductive or (as von Mises called it) praxeological conception of economic theory' (Gray, 1984, p. 17). Gray does not ignore, at all, von Mises's enormous influence on Hayek. He only asserts that the latter never accepted von Mises' *a priori* method as a whole, although he worked with the concept of human action and absorbed the Misesian subjectivism in his proposals. Hayek distinguishes the *a priori* elements of economic theory, but always, even in his writings of youth, as postulates and never as axioms. According to Gray, the essay 'Economics and Knowledge' (1937) – Hayek's contribution to a debate between von Mises and Lange – is even an attempt to show to von Mises a more empirical conception of the role of theory in economics. However, even in *Monetary Theory and the Trade Cycle* (1933), as we have seen, Hayek introduces an empirical element to economic theory, even if extremely limited. With this, Gray does not intend to state that Hayek does not respect the Austrian tradition – on the contrary – he is only trying to show that he is closer to Menger than to von Mises.

A Non-Unilateral Relationship

The relations between Hayek and Popper configure one of the most interesting dialogues of twentieth-century philosophy. Born in Austria with only three years of age difference, the two thinkers had somewhat different intellectual backgrounds in their youth. While Popper was attending Vienna's positivist circles, Hayek attended the seminars of some of the fiercest critics of positivism. Although they have crossed different paths, the two will meet for the first time at the LSE in 1935 and soon understand that many of their methodological conclusions coincided. From now on, the two thinkers remain in a permanent dialogue that intensified in the 50s and 60s. More than a mere professional relationship, a deep friendship developed, as Popper notes in his autobiography.

The references they make to each other throughout their methodological writings are numerous, and we are thus quite capable of understanding the dynamics of this relationship. Unfortunately, some commentators reduce this interaction to a unilateral relationship in which Hayek is completely absorbed. A typical example of this analysis can be found in the biography of Hayek where Hans Jörg Hennecke states that already in *Monetary Theory and the Trade Cycle*, Hayek independently arrived at a falsificationist position (Hauwe, 2007, p. 4). Now this statement is, as I have tried to make clear, true. In this essay, Hayek begins to outline his falsificationism by stating it is 'only in a negative sense that it is possible to verify theory by statistics' (Hayek, 1933, p. 34). The error lies in assuming that the falsificationism advocated by Hayek is a Popperian falsificationism. That statement is doubly wrong.

First, it is chronologically wrong. Hayek's falsificationism began to be established in 1929 and we can find it systematised in 'Scientism and the Study of Society', in 1944.

¹³ Hayek said in an interview in Madrid that: "The impact of Ludwig von Mises in the United States led to the fact that for a long time Austrian and Misesian were considered synonymous. I owe a lot to Mises, but I'm not originally one of his disciples, and I'm critical of him. Mises belonged to a tradition that was not compatible with the liberal. He was a rigid utilitarian, who believed that our intelligence could redefine our morals, our conduct' (Silva Moreira, 1994)

Although Hayek was already familiar with Popper's work in 1944, it is difficult to find his influence on the Austrian economist – other than a reference to Popper in 'Economics and Knowledge' – before the 1950s. This is easily verifiable since, after Popper's influence, Hayek will, as we shall see, reject the definition of scientism that advances in 'Scientism and the Study of Society'. It is possible, then, to conclude that all the claims that Hayek had converted to Popperian falsificationism before the 1950s are wrong, above all, chronologically.

To understand the second reason why such an assertion is erroneous – the theoretical reasons why I reject the association of Hayek's falsificationism with Popper (at least that of a 'first Popper') – we must study Popper's methodological position.

A First Popper

Hayek's associations with Popper's falsificationism refer, usually, to the falsificationism that Popper theorises in *The Poverty of Historicism* (1944), *The Open Society and Its Enemies* (1945) and *The Logic of Scientific Discovery* (1934). I will briefly summarise the proposal that Popper outlines in these works.

Popper notes that universal statements cannot be derived from singular statements, but can be contradicted by singular statements. That is, it is possible, through a simple *modus tollens*, to argue from the truth of the singular statements to the falsity of universal declarations. This is, he warns, the only argument that proceeds from the singular to the universal. So, there is no induction, no way to deduce universal statements from singular statements. With this, science is not done through induction, but through falsification by potential negative instances.

In these essays, Popper's methodological position can be characterised as a variant of methodological monism. We can see this clearly in *The Poverty of Historicism*:

'In this section I am going to propose a doctrine of the unity of method; that is to say, the view that all theoretical or generalizing sciences make use of the same method, whether they are natural sciences or social sciences' (Popper, 1944, p. 130).

Scientific explanation and prediction are always of the same logical structure, no matter what science it is. Popper does not deny that there may be some differences between the method of the theoretical sciences of nature and society,¹⁴ however, he asserts that the methods in the two fields are fundamentally the same: they always consist in offering deductive causal explanations and in testing them by means of predictions, never reaching the absolute certainty of any of the scientific statements which it tests; rather, such statements always hold the character of provisional hypotheses, although their testability may not be obvious after having undergone a large number of severe tests.

Popper also adopts a very specific view of explanation – causality. The methods of both sciences, he argues, should offer causal deductive explanations and test them through predictions. The causal explanation consists in the subsumption of individual cases under general hypothetical laws. This is where the hypothetical-deductive method arises. In defending monism and the need to seek causal explanations, Popper automatically includes

¹⁴ Popper even cites Hayek's 'Scientism and the Study of Society', and notes the difficulties in applying quantitative methods to the social sciences that Hayek describes (Popper, 1944, pp. 136-140). However, he argues that, unlike Hayek, he considers that the differences between the social sciences and the physical sciences are differences of degree and not of nature, and therefore, surmountable.

predictions of specific events as part of the scientific work given the logical equivalence between explanation and prediction and the need to subject theories to evidence.

Although the falsificationist conception is already present in Popper's proposal for methodological unity, the emphasis at this moment lies mainly on the causal character of scientific explanations, and not on the need to falsify theories, because he considers the hypothetical-deductive method a prerequisite for the possibility of falsifying theories.

Spontaneous Order Against the First Popper

As we can easily deduce, Hayek's methodological proposal is – initially – radically opposed to that of Popper, at least on some points. The fact that Hayek came (independently) to a falsificationist position does not imply that he has adopted Popperian falsificationism. In fact, Hayek would even be in tune with some of Popper's biggest critics.

Duhem-Quine's criticism of Popper's method shows that if a group of scientific theories and hypotheses T_1, T_2, \dots, T_n produces a prediction P that fails to be realised, then what we have is that something is wrong somewhere within the family: T_1, T_2, \dots, T_n . However, we have no idea what *particularly* is wrong. This is in tune with Hayek's thinking. Given the intricate nature of spontaneous orders – of complex phenomena – the Austrian also rejects, as we have seen, the idea of a crucial experiment. Indeed, Hayek already understands the problem posed by the Duhem-Quine critique in 'Economics and Knowledge' (1937), by showing the impossibility of satisfying unspecified *ceteris paribus* conditions to which all economic forecasts are subject. Hayek argued since the 1930s that given the complex phenomena of the social sciences, we always know that there is an indefinitely large number of potentially relevant variables that have been left out. Against Popper, Hayek denies the unity of the method, the ability to make individual predictions in the social sciences and the possibility of crucial experiments.

This is not to say that Hayek's positions remained intact during his relationship with Popper. As I have already stated, the relationship between the compatriots was quite fruitful and much less unilateral than some may think. Let's begin by noticing the revisions that Hayek made in his proposal after his contact with Popper.

The term scientism, which Hayek introduced in 'Scientism and the Study of Society', referred firstly to 'a slavish imitation of the method and language of Science' (Hayek, 1942, p. 80). However, in the preface to *Studies in Philosophy, Politics and Economics*, Hayek recognises a reformulation of this concept:

'Readers of some of my earlier writing may notice a slight change in the tone of my discussion of the attitude which I then called "scientism". The reason for this is that Sir Karl Popper has taught me that natural scientists did not really do what most of them not only told us that they did,¹⁵ but also urged the representatives of other disciplines to imitate. The difference between the two groups of disciplines has thereby been greatly narrowed and I keep up the argument only because so many social scientists are still trying to imitate what they wrongly believe to be the methods of natural sciences. The intellectual debt which I owe to this old friend for having taught me this is but

¹⁵ Here he refers to the erroneous and widely held belief that in the natural sciences research would begin with the observation of phenomena, and by means of an induction process one would arrive at the elaboration of theories that explain the observed regularities and that are capable of to predict new occurrences of the phenomena.

one of many, and it is therefore only appropriate that this volume should be in gratitude inscribed to him' (Hayek, 1969, p. 2).

In reformulating his understanding of the method of the physical sciences, he realised that it is actually closer than he thought to that which he proposes for the social sciences. Does this mean that Hayek comes to conceive of the unity of method between natural and social sciences? No. Hayek will continue to reiterate that the object of study of the social sciences are spontaneous orders and that the method involved in explaining phenomena with such order of complexity can never be confused with that of the physical sciences. Hayek only acknowledges that the differences between the two disciplinary groups have narrowed, but never asserts the unity of method. This is reinforced by the discussion that arose between these thinkers, in which Popper claims that the thesis of growing complexity in the social sciences is erroneous – a thesis that he already argued in *The Poverty of Historicism*:

'But in fact, there are good reasons, not only for the belief that social science is less complicated than physics, but also for the belief that concrete social situations are in general less complicated than concrete physical situations' (Popper, 1944, p. 140).

Such a statement completely ignores the specificities of spontaneous orders that follow from a Hayekian perspective. Moreover, it ignores a teaching that Hayek inherited from von Mises and which he never renounced: the object of the social sciences cannot be defined independently of the purposes of human actions and what people think about the object described. The increasing complexity when we distance ourselves from the inanimate realm towards the more highly organised structures of the animate and the social realm is only fully understood when we understand the human factor, the uncertainty inherent in the purposes of human actions and their intentional contents. Hayek thought Popper disagreed with this fundamental insight.

A New Popper

The product of this discussion is clear and results not in a more Popperian Hayek, but in a Hayekian Popper: Popper's defense of methodological monism gradually weakens so that in his essays of the late 1960s he uses concepts such as situational analysis and objective comprehension, which outline a methodological dualism that is the result of an understanding of the singular objects in the social sciences.

In differentiating prediction from prophecy in the social sciences, Popper concludes, against historicism, that 'the main task of the theoretical social sciences... is to trace the unintended social repercussions of intentional human actions' (Popper, 1962, p. 341). The philosopher extrapolates this analysis to the experimental sciences – something Hayek rejects – but we may begin to notice that Popper draws a methodological approach that culminates in the acceptance of the pattern predictions.

This becomes clearer when Popper elaborates on the notion of situational analysis. He concludes that, regarding the role of theoretical models:

'[...] the Newtonian method of explaining and predicting singular events by universal laws and initial conditions is hardly ever applicable in the theoretical social sciences. They operate almost always by the method of constructing

typical situations or conditions – that is, by the method of constructing models' (Popper, 1969, p. 166).

With this, Popper surrenders to the Hayekian thesis that in the social sciences there is less explanation in detail and more explanation in principle (Popper, 1969, p. 166). With regard to the question of the possibility of predicting specific events, Popper's position approaches that advocated by Hayek – and even coinciding with it. That is, he gives up the prediction of specific events in the context of complex phenomena in favour of a prediction of patterns of these phenomena. The philosopher argues that in the social sciences the explanation and prediction of singular events depends on the analysis of the universal laws involved and the initial conditions relevant in each case. The explanation and prediction of general events would obtain better results by constructing models. In the social sciences it would never be possible to give satisfactory answers as far as the prediction of particular events is concerned, since in his view, these are almost always using a model-building method. Popper uses the term 'model' in contrast to the term 'theory'. While theories use universal laws that allow predictions of singular events, models depart from initial conditions and seek rather to make statements about the nature or type of event in question. At this stage, Popper himself is moving away from the hypothetical-deductive method and, as such, from methodological monism. The importance he attaches to building models in the social sciences is an example of this. The emphasis on the causal character of explanations, following the scheme of the hypothetical-deductive model – typified in *The Logic of Scientific Discovery* and *The Poverty of Historicism* – is diluted in a growing emphasis on the falsificationist conception of method. The demands of falsificationism in the social sciences bring him closer to Hayek and to the compositional method. Although Hayek never became Popperian, Popper became a Hayekian in matters concerning the methodology of the social sciences.

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Discussion Article: Comments on João Pinheiro da Silva's paper: 'Popperian Hayek or Hayekian Popper?'

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The title of this article, 'Popperian Hayek or Hayekian Popper?' poses a question that I feel it never quite explores. Indeed, the short paper devotes less than half of its discussion to differences between Popper and Hayek. Its author, João Pinheiro da Silva, writes that 'It is obviously impossible to reduce Hayek's methodological proposal to a dozen pages' (Silva, p. 53). And he is obviously right about that. Silva tells us toward the end of his paper that we have a Hayekian Popper and not a Popperian Hayek. But I wish that he had actually explained why we have a Hayekian Popper instead of just stating that we do. Silva seems to believe that what made Popper's position Popperian is that it defended the unity of scientific method, or what he calls 'methodological monism'. But he does not adequately try to explain what Popper understood by the unity of scientific method and how it differed from what others have meant by that phrase. And this is significant. Popper told us that he agreed with John Stuart Mill, Auguste Comte and Carl Menger that the methods of the theoretical natural sciences and the theoretical social sciences are fundamentally the same. But he also told us that the methods that he had in mind might differ from the methods that they had in mind. So it is not at all obvious that Popper meant the same thing that most others who have talked about the unity of scientific method have meant by that phrase – or that he defended it for the same reasons. It would have been good if Silva had devoted more time to exploring such issues. And in what follows I will try to do so myself.

Let me begin by saying that Comte, Mill, the logical positivists, and most others who have argued for the unity of scientific method, understood scientific knowledge to be certain knowledge and scientific method to be a process of inductively inferring universal generalisations from observations of particular events. The Scientific Method, for them, meant the inductive method. The unity of method meant that the natural sciences and the social sciences both use, or should use, the inductive method. And it went hand in glove with the unity of science thesis – the idea that all of science can be based upon and reduced to the same epistemological foundations (usually understood as physics) – with the idea that scientific theories can be known with certainty, of one form or another, and with the idea that theories in the social sciences can be known with the same certainty as theories in the natural sciences. We know from Hayek's own writings that this is how he originally understood the method of natural science, and that his critique of scientism was that the social sciences were trying to use the inductive method in areas it doesn't belong. But this is not how Popper understood scientific method or the unity of scientific method. And Popper underscored the point by writing,

'Professor Hayek uses the term "scientism" as a name for "the slavish imitation of the method and language of science". Here it is used, rather, as a name for the imitation of *what certain people mistake* for the method and language of science' (Popper, 1957, p. 105).

Popper wrote that the methods of science:

‘... always consist in offering deductive causal explanations, and in testing them (by way of predictions). This has sometimes been called the hypothetical-deductive method, or more often the method of hypothesis, for it does not achieve absolute certainty for any of the scientific statements which it tests; rather, these statements always retain the character of tentative hypotheses, even though their character of tentativeness may cease to be obvious after they have passed a great number of severe tests.

Because of their tentative or provisional character, hypotheses were considered by most students of method, as provisional in the sense that they have ultimately to be replaced by proved theories (or at least by theories which can be proved to be ‘highly probable’, in the sense of some calculus of probabilities). I believe that this view is mistaken and that it leads to a host of entirely unnecessary difficulties’ (Popper, 1957, p. 131).

Popper, in fact, taught that there is no such thing as the scientific method over and above the method of conjecture and refutation, or trial and error. He taught that all scientific knowledge is hypothesis, or conjecture, or guesswork – and that scientific knowledge is different from mere guesswork not because it is justified, or certain, or has been shown to be true, or probable, but because it can be *tested*, and because we actually do try to test it as best we can. And he held this to be true of both the natural theoretical sciences and the social theoretical sciences. It is in this ironic sense, *and only in this ironic sense*, that Popper upheld the unity of scientific method.

I call it ironic, because Popper, unlike proponents of induction who defended the unity of scientific method, did not defend it in order to bolster the ‘scientific status’ of the social sciences, or the cognitive authority of the social sciences, or the possibility of achieving scientific certainty in the social sciences. Contrary to what Silva’s use of the term ‘methodological monism’ might suggest, Popper generally thought that scientists can use whatever methods they think will help them to solve their problems, so long as they use them critically and in an effort to discover truth. And he wrote that

‘As a rule, I begin my lectures on Scientific Method by telling my students that scientific method does not exist. I add that I ought to know, having been, for a time at least, the one and only professor of this non-existent subject within the British Commonwealth’ (Popper, 1983, p. 5).

Popper taught that science begins with problems and with hypotheses, or guesses, about how to solve them. He taught that what makes science ‘science’ is not that our hypotheses are certain, or true, or made in accordance with certain methods, but that we can test them to find and eliminate their errors. And he taught that our tests never verify or even confirm our hypotheses, but typically lead to new problems. He developed his so-called tetradic schema— $P_1 \rightarrow TT \rightarrow EE \rightarrow P_2$ —to encapsulate the idea. Here, P_1 is a problem, TT is a theory tentatively offered to solve it, EE is our attempt to eliminate the errors in TT via experiment and criticism, and P_2 is a new problem that arises from EE . Popper thought that this is the ‘method’ of all science, be it natural science or social science, and indeed the method of all rational discussion. It is, once again, in this ironic sense, *and only in this ironic sense*, that he upheld the unity of method. And it might, for this reason, be more appropriate to characterise Popper as upholding methodological relativism than methodological monism.

Silva, however, seems to think that ‘methodological monism’ involves a lot more than this. He writes: ‘I intend, in this essay, to delineate Hayek’s methodological dualism through the concept of “spontaneous order”, which I believe makes him immune to any pretension of scientific unity and thus immune to Popperian falsificationism’ (Silva, p. 46). But while he is certainly right that Hayek’s ideas about undesigned spontaneous orders are both important and key to understanding his philosophy, he never says why methodological monism is so bad, or why it is at odds with Hayek’s concept of spontaneous order, or how that concept would make one immune to it – let alone immune to falsificationism. And what he does say not only seems to conflate the idea that the social sciences and the natural sciences use the same method (the unity of method thesis) with the idea that the natural sciences and the social sciences are themselves one and the same (the unity of science thesis). It also suggests that this conflation is somehow necessary for Popper’s falsificationism. I wish that Silva had said more about this, since I don’t see any reason to believe either contention. Indeed, I do not understand what it would mean for Hayek, or anyone else, to be *immune* to Popperian falsificationism – which in turn raises questions about how many different kinds of falsificationism there might be aside from Popper’s.

Be this as it may, my own sense is that Popper’s defense of the unity of scientific method is not so strict or absolute as Silva seems to think. It should be clear that Popper, in defending the unity of scientific method, never meant to deny that there are differences, and indeed very important differences, between the methods of the natural sciences and the methods of the social sciences. For Popper not only tells us this himself, he also talks about such differences in the very context of arguing for the unity of method. He thus writes:

‘I do not intend to assert that there are no differences whatever between the methods of the theoretical sciences of nature and of society; such differences clearly exist, even between the various natural sciences themselves, as well as between the various social sciences’ (Popper, 1957, p. 131).

And he later identifies the fact that the social sciences can use the so-called ‘zero-method’ – the method of logical or rational construction, part and parcel of situational logic with its assumption of complete rationality and complete information – as the most important difference in the methods of the natural and social sciences (Popper, 1957, p. 141).

I find other things that Silva says misleading, and sometimes simply false. He thus writes that: ‘While Popper was attending Vienna’s positivist circles, Hayek attended the seminars of some of the fiercest critics of positivism’ (Silva, p. 54). This, I take it, is supposed to suggest that Popper himself was a proponent of positivism and that Hayek was a critic of positivism. But if I am right about this, then I find it misleading in at least two ways. For Popper, on the one hand, was never a member of the Vienna Circle – which was essentially Moritz Schlick’s private seminar – because he was never invited to attend its meetings. And Popper, on the other hand, actually *was* one of positivism’s fiercest critics. This, indeed, seems to be one of the reasons why Popper was never invited to attend any of the meetings of the Vienna Circle. Members such as Moritz Schlick and Otto Neurath were not only skeptical of his views, they regarded him as ‘the official opposition’.

Silva also writes: ‘given [Hayek’s] contact with Karl Popper, several historians and philosophers have characterised his final position as Popperian, that is, a position that would have accepted the unity of the scientific method’ (Silva, p. 46). Does this mean that accepting the unity of scientific method – as opposed, say, to accepting fallibilism, or our inability to prove the truth of scientific theories, or the idea that scientific theories cannot and need not be justified – is what makes a philosopher or a position Popperian? So that Mill and Comte and

Menger were all Popperians because they accepted the unity of scientific method, even though they disagreed with Popper about what scientific method actually is, or why the methods of the social sciences and the methods of the natural sciences are fundamentally the same?

Silva also writes: 'In defending monism and the need to seek causal explanations, Popper automatically includes predictions of specific events as part of the scientific work given the logical equivalence between explanation and prediction and the need to subject theories to evidence' (Silva, pp. 55-56). But science, for Popper, is not about predicting the future. It is about explaining what we do not understand. And we try to explain what we do not understand by showing that and how it follows logically from certain laws and initial conditions that we do understand. Here, the point to be made is that Popper thought that predictions of specific events are part of scientific work not because the aim of science is to predict future events but because predicting future events can provide a way of testing our explanatory theories. If we can deduce a prediction from an explanatory theory and certain initial conditions, then we can test that theory by looking to see whether or not that prediction comes true. But contrary to what Silva seems to suggest, there is no *need* to falsify theories. I do not understand why he thinks that there is. We would certainly not want, let alone need, to falsify a theory if it is *true*. But we do want a theory to be *falsifiable*. For if a theory is not falsifiable, then there is no way test whether it is true.

These are just a few of the problems that I see in Silva's paper. There are others, Silva, writes: 'The product of this discussion is clear and results, not in a more Popperian Hayek, but in a Hayekian Popper' (Silva, p. 57). I think that what he means by this is that Hayek influenced Popper, at least about the unity of scientific methods, more than Popper influenced Hayek. I do not think that the product of his discussion is clear at all, or that it clearly results in a Hayekian Popper. Silva wants to say that Popper became more Hayekian in his later years by softening his methodological monism. He writes that

'Popper's defense of methodological monism gradually weakens so that in his essays of the late 1960s he uses concepts such as situational analysis and objective comprehension, which outline a methodological dualism that is the result of an understanding of the singular objects in the social sciences' (Silva, p. 57).

But Popper uses the concept of situational analysis, situational logic, and the logic of the situation in many if not most of his discussions about social science. He uses it, more specifically, in *The Open Society and Its Enemies* and, indeed, in *The Poverty of Historicism* – and he uses it in the very context in which he defends the unity of scientific method. Both of these books can be traced, at least, to the 1940s. So I don't quite see how Silva's idea is supposed to work.

Nor do I see that or how Popper softened his methodological monism. And quite aside from this, my own sense is that it was Hayek who softened his opposition to the idea that the natural sciences and the social sciences use more or less the same methods, and that he did so in changing his understanding of scientism and consciously under the influence of Popper.

This is something that I think Silva knows, for he tells us that Hayek first used the term 'scientism' to refer to 'a slavish imitation of the method and language of Science' and that he later softened his critique of scientism when he recognised that the method and language that some social scientists were slavishly imitating were not actually the method and language of natural science.

And we know that Hayek consciously changed this view under the influence of Popper because Hayek himself tells us so. Thus, in the preface to *Studies in Philosophy, Politics and Economics*, Hayek wrote that:

'Readers of some of my earlier writing may notice a slight change in the tone of my discussion of the attitude which I then called 'scientism'. The reason for this is that Sir Karl Popper has taught me that natural scientists did not really do what most of them not only told us that they did, but also urged the representatives of other disciplines to imitate. The difference between the two groups of disciplines has thereby been greatly narrowed and I keep up the argument only because so many social scientists are still trying to imitate what they wrongly believe to be the methods of natural sciences. The intellectual debt which I owe to this old friend for having taught me this is but one of many, and it is therefore only appropriate that this volume should be in gratitude inscribed to him' (Hayek, 1967, p. 2).

Here, the point to be made is that Hayek softened his critique of scientism because he came to recognise that his ideas about the methods of the natural sciences were mistaken. More specifically, he came to recognise that the natural sciences do not adhere to the inductive method of observation and generalisation, contrary to what many positivists claimed. Hayek tells us that Karl Popper taught him this. But he also recognised that if his ideas about the methods of the natural sciences are false, then his idea that the methods of the social sciences are fundamentally different from those of the natural sciences is also likely to be false. This is what Hayek means when he says that 'The difference between the two groups of disciplines has thereby been greatly narrowed'. And this, simply put, means that the differences between the methods of the natural sciences and the methods of the social sciences are not as great as he had thought.

Silva seems to recognise this possibility. But he also immediately rejects it. He writes:

'In reformulating his understanding of the method of the physical sciences, [Hayek] realises that their method is actually closer to that which he proposes to the social sciences than he thought. Does this mean that Hayek comes to conceive of the unity of the method? No. Hayek will continue to reiterate that the object of study of the social sciences are spontaneous orders and that the method involved in explaining phenomena with such order of complexity can never be confused with that of the physical sciences. Hayek only acknowledges that the differences between the two disciplinary groups have narrowed, but never asserts the unity of the method' (Silva, p. 57).

But my own sense is that it does indeed mean that Hayek came to conceive of the unity of method, at least as Popper understood it, and that he did so regardless of whether he ever explicitly asserted it.

I think that this is the way Hayek saw it too. He told James Buchanan in an interview in 1978 that he and Popper 'became very close friends' in the years they were together at the LSE – 1945 to 1950 – and that 'we see completely eye-to-eye on practically all issues' (Hayek 1978). And he told other interviewers, late in life, that he and Popper were very close friends and that 'to a very large extent I have agreed with him, although not always immediately' – adding that 'on the whole I agree with him more than with anybody else on philosophical matters' (Hayek, 1994, p. 51).

My own sense is that it is this, as opposed to any misconceptions that they may have had about the importance and centrality of Hayek's concept of spontaneous order, that have led many philosophers, historians and economists to understand his 'final position' as Popperian.

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