Agents, interaction, and economic laws:
An analytical framework for understanding different economic theories

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Abstract: This paper provides an analytical framework allowing the accommodation, comparison and classification of different economic theories and schools of economic thought. We provide the basic analytical elements to address the explanatory potential of economic models as well as a criterion for scientific progress. The starting point is that in “modern economic theory”, each particular theory –and all models derived- share a common structure. This common structure is formed by a set of statements $S_1$ which characterize the agent (its properties and modes of interaction) and its action (including choice) space; a set of statements $S_2$ regarding the economic behavior of the characterized agent, and a set of economic laws $L$ which are logical co-implications of the systematic application of $S_2$ over $S_1$. This set or system of statements $T = \{S_1, S_2, L\}$ forms a theory. It is possible to address the explanation of new economic phenomena or processes by developing new economic models or theories $T$. This exercise is made possible by adding properties, qualifications or new information to the statement systems $S_1$ and $S_2$ that lead to new laws $L$. The approach proposed is useful for classifying different economic theories as illustrated by an analysis and characterization of the Neoclassical, Austrian and Keynesian theoretical frameworks.

Keywords: economic theory, allocative processes, action plans, economic behavior, economic laws

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1. Economics as a theory of allocative processes

The assumption that Economics is a science implies that it should have a matter of study clearly defined (Robbins 1932). As far as Economics focuses on human action in the presence of scarcity, we may identify phenomena that deserve an economic explanation. However, there are so many different theories and schools of thought that provide rival and even contradictory explanations (and recommendations) about what are –apparently– the same phenomena that a state of controversy pervades economic theorizing. This controversy should draw the attention of (theoretical) economists. For instance, why are there (so many) different theories and schools of economic thought? What is the reason why there are different explanations of (apparently) the same economic phenomena and, therefore, different economic policy recommendations? What –if anything– is the object of economic theory, and in which way should scientific investigation proceed?

Many explanations have been provided for these questions, from the history and methodology of economics (Blaug 1992) to the philosophy and sociology of economics (Hands 1994). However, the objective differences between theories (and schools of thought) derive not only from the ontology (Lawson 2012) that theoreticians rely on but also from the fundamental assumptions and characterizations that they make regarding (economic) agents and their space of interaction (the society). The economist’s view of economic agents (who they are and how they interact) and processes determines which relevant phenomena should be explained, how to proceed in that explanation and which consequences are drawn from it, i.e., the economic laws that govern those phenomena.

To establish a starting point that we can use as a reference for what follows, we understand Economics as the science that explains how agents make choices and, consequently, act in the presence of scarcity in a (more or less) complex environment and what the consequences of their actions are. Otherwise, in Loasby’s (1976:1) words, economics studies “choice, and the implication of choice, within complex systems provide the basic subject-matter of economics”. Provided that choices become appropriate courses of
action deployed by agents, Economics is not only about merely choosing the optimal consumption basket or the production level that gives the maximum benefit, but to actually consume, produce, etc., activities that, as far as they are rational, follow planned courses of action. In other words, agents choose between alternative planned courses of action and deploy -or at least try to deploy- the selected action plans, in interaction with other agents in a social environment, producing as a result new instants of personal and social reality (Muñoz & Encinar 2014; Wagner 2012).

The basic process of choosing is characterized by the projective allocation of means to alternative imagined - and deemed possible (Loasby 1996) – ends or goals. In this sense, “modern economics […] provides a special theoretical explanation of the allocative operation and implies a theoretical structure for the (analytical) explanation of the selected plan -and its properties-, the production of interactive personal action and its results” (Rubio de Urquía 1998).

Objectively, and from a purely formal point view, a theory consists of a system of statements about how reality is, regardless of the formal apparatus it employs to manifest (pure text, logics, equations, graphics, computer code, etc.). An economic theory is a particular case of theory in which statements refer to agents (beliefs, preferences, values, cognitive resources, etc.), modes and means of interaction (markets, organisations, institutions, technology, “society”, etc.) and the consequences (outcomes) both purposive and unintentional of interaction among them.

Economic theory usually proceeds by means of building models. A model is an abstracted description of a process, object, or event that exaggerates certain aspects at the expense of others. When processes are relatively simple and isolated, model building does not imply an important challenge for the theory. This is not the case for Economics, which addresses complex open systems.¹ Thus, to proceed with their scientific enquiries, economists must construct different types of closed models for explaining real open

¹ A complex system is one composed of many interacting parts in which the emergent outcome of the system is a product of the interactions between the parts and the feedback between that emergent outcome and individual decisions (Wilenski & Rand 2015). Systems are open as far as “[t]hey maintain their boundaries but, at the same time, they are open systems that are irrevocably connected to an environment that contains other systems that can be complementary, competitive, combative, predative or available as prey” (Foster 2005: 874).
**systems** (Loasby 2003) where closed models are both the conditions of possibility and limitations of theory itself.² In Economics, closed models can be seen as a collection of statements of different nature that characterize allocative processes.

The aim of this paper is to provide an analytical framework that allows us to accommodate, compare and classify different economic theories and schools of economic thought. The argument provides the necessary analytical elements to address the explanatory potential of economic models as well as a criterion for scientific progress. The starting point is that in “modern economic theory”,³ each particular theory –and all models derived from them- shares a common structure that, being more or less explicit, allows us to compare theories. Following Rubio de Urquía (1998) we argue that this common structure is formed by a set of statements $S_1$ that characterize the agent (its properties and modes of interaction) and its action (choice) space; a set of statements $S_2$ regarding the economic behavior of the characterized agent, and a set of economic laws $L$ which are logic co-implications of the systematic application of $S_2$ over $S_1$. This set or system of statements $T = \{S_1, S_2, L\}$ forms a theory. It is possible to address the explanation of new economic phenomena or processes by developing new economic models or theories $T$. This exercise is possible by adding properties, qualifications or new information to the statement systems $S_1$ and $S_2$ that lead to new laws $L$.

Perhaps the main claim of this paper –that a theory considers and characterizes agents, modes of interaction, etc., and deduces the consequences of interactions- seems unsurprising at first glance. The specific contribution consists of systematically organizing and clarifying the relationships of all these elements around a common element that allows us to set the basis for comparison of different economic theories. This element is what we call the principle of economic behavior.

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² In fact, both economic agents and the space of interaction are open systems (Potts 2000). For this reason, economic models, theories and procedures can never be proven true (Ziman 1978). Thus, a theoretical practice to tackle with this difficulty consists of constructing closed models as a means of initiating and proceeding with theoretical investigation.

³ In this paper, for “modern economic theory” we mean the corpus of economic thinking that derives from the Marginal Revolution, in particular from Walras, Menger and Jevons. This includes mainly Neoclassical, Austrian, and Keynesian economics.
The paper is organized as follows. Section 2 introduces and describes how the theoretical logic of $T = \{S1, S2, L\}$ works in general. Section 3, shows several examples of how this approach can be applied to any particular economic theory and thus how the approach allows us to compare and classify economic theories. Section 4 discusses some theoretical implications of this framework and a criterion for scientific progress is proposed.

2. The analytical structure of economic theories

Economic processes are unique processes that unfold within the general human action. These processes manifest in very different ways: production, consumption, exchanges, investment, trade, etc. However, we may assess, without loss of generality, that there is a basic economic process that constitutes the subject matter of the economic theory, a process that consists of the selection and adoption of agents’ action plans -both individually considered or in a mutual interaction regime- and the results of the agents’ attempt to execute the selected action plans. It is possible to identify an abstract and fundamental feature common to all conceptions about the object of modern economic theory. This is the reason why, to the extent that economic processes share this common basic structure, the structure of the different economic theories is also necessarily common, which provides the basis to compare theories which are apparently contradictory as well as schools of thought.

From an analytical point of view, this general structure can be described as follows:

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4 It is a process because, firstly, economics refers always to processes (action and not only decisions); secondly, it is economic because scarcity is the main feature of what we call economics; and thirdly, it is basic because independently of the level of analysis (micro, macro or meso), it is a type of underlying operation that determines its economic character. Regarding this last feature, it is important to remember the efforts of the microfoundations of macroeconomics (Weintraub 1979), of meso level analysis (Dopfer & Potts 2014a) and, in general, of social processes (Schelling 1978). We speak about processes and not merely of phenomena because processes are the bases of the emergent phenomena that economics studies— for example, innovation, inflation, etc. For any rational explanation of these phenomena, the theory necessarily addresses to the underlying processes that generate them (and not merely to other phenomena, as statistics does).
1) Certain processes taking place within the general process of production of human action generate the sets of scarce means and alternative ends. These processes are at the basis of the set of alternative action plans $P_i(t)$.5

2) A specially identified process taking place within the general production process of human action, the allocative operation, selects the action plan $p_i^*(t) \in P_i(t)$ effectively adopted by the agent among the set of alternative plans conceived.

3) Agents ($i = 1, \ldots I$) interactively deploy their selected action plans $p_i^*(t)$, and as a consequence (intentional and unintentional) of the social interaction $\Delta S(t)$, the products of the action emerge: changes or developments in the agents and their states, in the physical and socio-economic environment, etc. These products are recorded, at least partially, as statistics, history, etc.

4) As far as agents are experimenting the variations in the human and not human environment caused by the interactive deployment of their action plans, they change (adapt, transform, innovate…) their sets of plans $P_i(t + 1)$. This feedback mechanism may result in learning and knowledge acquisition.6

The result is a complex process of production of interactive action.7

Any theoretical explanation or analytical determination of the selected plans and both the intended and unintended consequences of interactions consists of a structured set or system of theoretical statements about: (a) the processes generating the set of alternative plans for each agent, and (b) the nature of the allocative operation taking place once these sets of plans are defined.

Modern economics addresses primarily this type of allocative process. Therefore, a necessary element of each theory is the main principle that guides agents in their allocative decisions, to which we refer as economic principle. Thus, we argue that any

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5 The concept of an action plan is rather common among economists of (apparently) different traditions, such as Keynes, Hicks, Stackelberg, Eucken, Debreu, Malinvaud, Boulding, and Metcalfe, for example. It is quite important not to confuse action plans with a central planned economy. For a systematic exposition of the action plan approach, see Rubio de Urquiá (2005) and Muñoz & Encinar (2014).

6 On learning, see Dosi et al. (1996, 2000) and Soros (2013).

7 Whether current economic theories consider economic systems as evolving complex systems (Anderson et al. 1988; Arthur 2015) or not is another issue to which we will refer later.
economic theory consists of a structured set that contains three different types of statements that characterize an allocative process:

1) statements that characterize the agents (who they are, the nature of the agents’ knowledge, the (in-)compatibility of action plans, etc.), the environment (both social and physical) within which the agents interact -including the existence of means for interaction (i.e., money)-, the types of interactions among the agents themselves and, eventually, with the environment; we denote this set of statements as $S_1$.

2) statements regarding the specific economic principle that guides allocative decisions, denoted $S_2$. As will be shown, this principle is usually adapted depending on the specific content of $S_1$ (for example, in the context of Neo-Walrasian theory, this principle takes the form of optimization principle, maximizing behavior, etc.);

3) statements regarding the (emergent) occurrences (outcomes) resulting from the interaction of the courses of action contained in $S_1$, selected according to $S_2$ and deployed in the agents’ external milieu, which we will refer to as the economic laws of that allocative process, or $L$.

We refer to the set of statements $T = \{S_1, S_2, L\}$ as an economic theory of the allocative process characterized by $S_1$ and $S_2$. Thus, the statements included in the set $T$ form a theoretical explanation for an economic phenomenon $\varphi$ if that occurrence is included as a possible outcome of the process characterized by $T$; that is, if $\varphi \in D(L)$, where $D(L)$ is the domain of the occurrences anticipated by the laws of the corresponding allocative process.

2.1 Agents’ means and objectives and structures of interaction

Let $S_1$ be a system of statements characterizing the sets of scarce means (actions) and alternative ends (goals) analytically attributed by the theoretician as being those

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8 For example, the action plans that agents project, select and deploy under a particular state of expectations generate new realities (emergent properties, novelties, etc.) that modify expectations themselves. Many outcomes are, in practice, unintended consequences of action, a question that attracted much attention by Hayek (1988) and Popper (1948).
conceived by each analytical agent (person or organization) at time $t$. Any type of means and ends may be considered: material or not, located at any point of (objective) time, possible in any (physical, for instance) sense or not, capable of valuation in terms of “money” or not, etc. Let $P_i(t)$ be the (non-void) set of alternative plans for each agent $(i = 1, ..., l)$ defined by $S$.  

A plan $p_i(t) \in P_i(t)$ is a plan that is defined at $t$ and is formed by a specific structure of projective linkages of specific means (actions) and ends (goals) spanning a certain subjective time horizon (the “future”) for the analytical agent $i$. 

Given the above analytical structure, a very wide range of models and theories may be included in $S$, from very simple statements, such as “the sets of scarce “means” and alternative “ends” are habitual invariant through time” (as occurs in the Arrow-Debreu literature), to very complex theories on evolutionary socio-economic systems (Arthur 2015; Kirman 2011). Part of the economist’s work consists of characterizing the types of analytical plans and interactions that generate analytical outcomes that can address more clearly the empirical reality. An alternative is, for example, to consider that only action plans whose means and ends are susceptible to monetary expression should be the subject of theoretical analysis. Another alternative would be to address the allocative link between means and ends that are not valued in monetary terms. The theorist may limit his/her explanatory efforts to address feasible plans but could also decide to address unfeasible or inconsistent plans. She could limit the explanatory power of a theory to the allocation of a set of well-known means to a set of well-known goals (e.g., benefit maximization) but could also choose to address the invention of goals (e.g., the theory of the entrepreneur, of choice under true uncertainty). Theories also differ in the

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9 Although in mainstream economics, ends (objectives or goals) are given, no means or goals have to be given a priori: we may consider agents that produce their goals –by means of creativity, etc.
10 Familiar examples are plans of production, investment, consumption, etc.
11 An imagined future (Loasby 2007; Shackle 1979; Earl 1983). Although not exactly the same, see in this context the role of expectations. The interested reader may find a graphical representation of action plans in Rubio de Urquía (2005).
12 See for instance Radin (2001). For a critical position, see Arrow (1997). In any case, action plans with all means and ends expressed in monetary terms are the most characteristic of modern economic theory.
13 Inconsistencies can appear (Sen 1993), but this does not mean that the agents are irrational. This is similar to what happens, for example, with the framing effects Kahneman & Tversky (1979) and Tversky & Kahneman (1986). However, for various reasons, such common characteristics of the action are usually not considered in mainstream economic theory, being relegated, at best, to anomalies, paradoxes or topics of the economics of behavior.
14 On entrepreneurship, see for example Schumpeter (1912, 1947), Casson (1982); on uncertainty, see, Knight (1921), Shackle (1972), etc.
characterization of the environments in which agents interact, which, for example, may take the form of markets in societies with certain governmental institutions, of companies with central planning, etc. and may also consider interactions with the physical environment (as is the case, for example, of environmental economics).

2.2 The economic principle

The most characteristic feature of modern economic theorizing consists of the systematic application of the principle of economic behavior (economic “rationality”) to $S_1$ in order to obtain the specific outcome of the agents’ choices. In our specific framework, $S_2$ is the set of statements defining the characteristics that a plan must fulfill at time $t$ in order to be selected by the agent. $S_2$ characterizes the economic principle, which determines the plan belonging to $P_i(t)$ that satisfies what is implied by $S_2$; the selected plan is the best alternative course of action given the characterization of the agent and the specific circumstances under which this choice is made – that is, given $S_1$. (In modern economics, the most famous expression of the economic principle in terms of a calculus of utility maximization is provided by Edgeworth (1881).) Below, we will see how different $S_1$ and $S_2$ give rise to different economic laws $L$; here we note that as far as the economic principle is at the core of modern economic theory, it allows us articulate our analytical framework for comparing different theories (and models) on this basis.

2.3 The economic laws of the allocative process

Consider an allocative process defined by $S_1$ and $S_2$, where $S_2$ is the system of statements characterizing the economic principle relative to $S_1$. Economic laws $L$ are defined as the co-implications derived from $S_1$ and $S_2$. Economic laws, together with $S_1$ and $S_2$, characterize the allocative process (the dynamics of interaction and its outcomes) and the properties of the selected plans. Thus, properties characterizing the selected plans are logical co-implications of $S_1$ and $S_2$. Economic laws define the range of phenomena that the so defined allocative process can accommodate or explain.

2.4 Economic explanation
What does an economic explanation consist of within this analytical framework? Let us consider an economic phenomenon \( \varphi \) that the economist judges as deserving an economic explanation, for example, the presence of persistent involuntary unemployment in an economy. To explain \( \varphi \), a theory \( T \) must include this statement as an occurrence of the allocative process defined by \( T \), i.e.: \( \varphi \) must be included in the domain of \( L \) or, otherwise, \( \varphi \in D(L) \). In addition, as we have just seen, \( L \) is the analytical implication of systematically applying (using different and appropriate deductive techniques) \( S_2 \) over a specific system of statements that characterize agents, interactions, etc., \( S_1 \). As economic laws are logical implications of \( S_1 \) and \( S_2 \), different specifications of these statements imply different logical results. Summing up, \( L \) are the resulting conditional statements: they are the economic laws of the economy characterized through the specific statements \( S_1 \) and \( S_2 \).

3. Comparing and classifying economic theories

3.1 A way for comparing economic theories

In an exhaustive compilation and systematization, Rubio de Urquía (2000) documents how economists have proceeded for a long time following the scheme described above. That is why this approach may be applied to the three main systems of modern economic theory, namely Neoclassical, Keynesian and Austrian economics. The contents of \( S_1 \) (and consequently of \( S_2 \)) must be carefully differentiated for each theory. Deduction techniques and modes of expression of economic laws \( L \) are also different, as well as the ways of conceiving the explanatory validity of a theory. Thus, we can properly speak

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16. All scientific doctrines tacitly or implicitly assume certain conditions and are in this sense hypothetical (Marshall 1920 [1961]) chapter III, book I). “Though economic analysis and general reasoning are of wide application, yet every age and every country has its own problems; and every change in social conditions is likely to require a new development of economic doctrines” (Ibid., p.37).
18. The mathematization of the theoretical economic models affects the way that statements are made about the agents, inferential techniques used to obtain economic laws and how those laws are formulated. See Weintraub (2002), Mirowski (1989, 2002), and Hodgson (1993).
about characteristically Neoclassical, Keynesian and Austrian allocative processes. Different economic laws generally predict different outcomes.

The central economic laws of Neoclassical economics explain the formation, adoption and deployment of plans of typically Neoclassical agents.\textsuperscript{19} For example, regarding \textit{S1}, for the vast majority of Neoclassical authors, the economy is made up of consumers and producers that interact within markets. A consumer is usually characterized by a set of given scarce means, all with a monetary value expression (i.e.: a budgetary constraint), and a set of characteristic choice combinations of the main objectives, verifying the following properties: all objectives are susceptible to monetary value expression, all combinations of objectives are fully feasible, the combinations of objectives are alternative choices because the consumer cannot reach more than one at a time and a schedule of preferences exists whereby the consumer hierarchically organizes all the combinations of choices. Under these conditions, consumer’s action consists of allocating his/her means in the different markets to achieve the most preferred combination of objectives. This is the right modalization (\textit{S2} adapted) to that set \textit{S1} (previously described) of the principle of economic behavior.\textsuperscript{20}

In addition, the producer is defined by a set of production possibilities, each of which is itself a production plan that defines how to achieve certain objectives by applying certain means, verifying the following properties: all means and objectives of each plan have a monetary value expression, and all plans are feasible plans. The producer’s action consists of carrying out the production plan of highest hierarchical rank (highest profits).

An neat example of this is Debreu’s (1959) characterization of the producer and his courses of action (namely choices): \textit{S1} occupies much of chapter 3, while \textit{S2}, adapted to that specification, appears on page 43: “\textit{[g]iven the price system \textit{p}, the \textit{jth} producer chooses his production in his production set \textit{Y}_{\textit{j}} so as to maximize his profit. The resulting}

\textsuperscript{19} These laws are interpreted by most of the authors as based on a decentralized and free market economy, but it is also possible, to interpret them as the result of the central planning of the economy; this interpretation has, in fact, been made.

\textsuperscript{20} For the neoclassical models, the set of means, measured by their monetary value, are income or consumer income; the objectives are consumer goods, each combination of objectives is therefore a certain combination of consumer goods; the choice feature, or characteristic way the consumer prefers is the preference structure, which is generally represented by the utility function. Under these conditions, the principle of economic behavior is usually translated into an optimization (utility) problem subject to restrictions (budget).
action is called an equilibrium production of the jth producer relative to p” (italics in the original). That is, in this particular theory, the producer problem may be characterized in terms of $S2$ as follows:

$$\max_p p \cdot y_j$$

$$y_j \in Y_j$$

where $y_j^* \in \{ p \cdot y_j^* \geq p \cdot y_j, \forall y_j \in Y_j \}$ is the best choice-action plan- of production for the jth agent in that economy characterized by S1.\textsuperscript{21}

In Keynesian economics, with regard to the S1 set, two important types of agents are considered in addition to consumers: (a) the entrepreneur (not the producer), and (b) a peculiar agent that Keynes calls the State or central authority (Keynes 1936, chap. XVIII). Keynes’ characterization of the entrepreneur is completely different from the producer’s characterization in the fundamental theoretical framework of the Neoclassical doctrine outlined above. For Keynes, the entrepreneur is not essentially a chooser, and his/her plans are not necessarily referred to as means and objectives of action that all have monetary value, nor is he/she supposed to be installed on an objective time horizon affordable to rational calculation (see Keynes 1936, especially chap. XII). For Keynes, the entrepreneur is a rather unique agent, imperfect in the sense that he/she is considered capable of being wrong in his/her calculations. It is the way in which he characterizes the entrepreneur that makes it necessary to distinguish Keynes’ doctrine from that of Neoclassical economics. The economic laws of the Keynesian central model contain important Neoclassical elements but are a peculiar synthesis of the projective nature of entrepreneurial plans and the mechanism of consumption plans.\textsuperscript{22} The theory considers (as a logical possibility) the incompatibility a priori of both types of plans, and, consequently, the rationing of action.\textsuperscript{23} Keynes’ theory is part of modern economic theory, but not of Neoclassical theory.\textsuperscript{24}

\textsuperscript{21} Laws are deduced from paragraph 3.5 (price variations). See Debreu (1959: 47).
\textsuperscript{22} See in his General Theory the different treatments of consumption and investment
\textsuperscript{23} Keynes (1936), especially chapter XII. See also Clower (1965), Leijonhufvud (1998), and Benassy (1986).
\textsuperscript{24} In Lachmann’s (1976) opinion, Keynes himself and some of his followers, such as Shackle, approached subjectivism and thus Austrian economics.
Austrian economics makes yet a different characterization of agents and the economy. While the Austrian school shares enough elements with the Neoclassical doctrine to identify both as special types of a more general theory (modern economic theory), it is, since its foundation by Menger (1871), completely different from Neoclassical economics. From the point of view of the characterization of the agents and their modes of interaction, it is possible to differentiate the following distinguishing features of the Austrian model: (a) a special emphasis on the projective nature of the processes of accommodation of means that fall, according to the authors, under the field of economics (whether it is about need satisfaction -Menger- or about market movements -Mises and Hayek) and therefore the emphasis on learning, expectations, etc.; (b) the dynamically changing nature of the entire economic process, including the process of creation, transformation and elimination of habits and preferences, techniques, markets and even institutions; (c) the non-autonomous nature of the economic sphere from ethics, conceptions of the world, beliefs, cultural dynamics and cognitive processes of the agents. Austrian economic laws explain the formation, adoption and deployment of plans by certain types of agents, the entrepreneurs, that in the absence of any (distorting) allocative intervention of a central authority, engage in a dynamic process of interaction through markets, the so-called market process.\(^{25}\)

Table 1 schematically summarizes the analytical structure of economic theories by means of the previous analytical framework. As argued, this framework allows us to show prominent specific contents of the statements \(S_1, S_2\) and the implied economic laws, \(L,\) of Neoclassical, Keynesian and Austrian economics.

[Table 1 near here]

We show in this table how different sets \(S_1\) can be characterized according to agents, type of knowledge, agents’ environment of interaction, the presence of an equivalent of value and the consistency feature of plans. Thus, in the Neoclassical economics, agents react to changes or incentives and are unable to conceive plans (that are taken as given). In this context, acting consists of choosing the best end in relation to a given means. The Keynesian agent is quite different, in particular, the entrepreneur: s/he has the ability to

make expectations about her/his future. Contrary to Neoclassical economics, Keynesian economics allows the consideration of changes in the structure of agents’ action plans; changes in agents’ plans may be induced by changes in their ideas about the future. Finally, Austrian economics considers that agents can make plans and imagine/discover their own future. Entrepreneurship and rules shape agents’ plans under the hypothesis of imperfect (incomplete) knowledge or uncertainty.

The interaction environment is quite different across these paradigms. Neoclassical economics takes for granted the existence of (competitive) markets, and firms and consumers interact in markets, but there is no real explanation of the way these (competitive) markets work. In Keynesian economics, markets (competitive) also interact with a “central authority”, which has “a greater responsibility for directly organising investment” (Keynes 1936). Austrian economics considers the evolution of the markets as a result of a dynamic process by which markets are always in a state of disequilibrium but have a strong tendency toward equilibrium by means of entrepreneurship and discovery.

Neoclassical economics assumes that the value of the means and ends of an allocative process can be expressed in terms of a general equivalent of value (in terms of “money”), and this is quite the same in the Keynesian and Austrian allocative processes.

With regard to knowledge and the properties of action plans, Neoclassical economics assumes Olympian rationality (Simon 1983: 19) and perfect knowledge of market conditions in order to solve the optimization problem. These hypotheses assure that all plans in the economy are consistent, feasible and compatible a priori; that is, the analytical conditions under which General Equilibrium (and Pareto efficiency) are equivalent to the logical possibility of pre-reconcilable choices (Weintraub 1979). In contrast, Keynesian economics considers as an analytical possibility the incompatibility a priori of agents’ action plans and consequently, the rationing of action as a likely outcome. Thus, Keynesian economics allows processes of discoordination that produce equilibrium in good markets and disequilibrium in labor markets. Finally, in Austrian economics, it is possible to discover in the markets some types of disequilibrium due to the existence of plans that are unfeasible or mutually incompatible. In this case, entrepreneurship triggers process that result in coordination gains leading the economy towards a general
equilibrium (coordination) of plans. This is, in fact, a tendency of the model, because this state is never attained due to the presence of novelty.

Although the most obvious examples are presented in Table 1, we can extend it (see Table 2) to make room for other types of theories that share—at least partially— the characteristics of the three main types of allocative processes. It is the case, for example, of game theory (von Neumann & Morgenstern 1944), evolutionary economics (Dopfer et al. 2016) and computational economics (Tefsatsion and Judd 2006), including agent-based modeling (Tefsatsion 2016).

[Table 2 near here]

The approach proposed proves to be useful for classifying different economic theories—and schools of economic thought— because as far as it refers to a common economic process, the allocative process, which is present in all modern economic theories as far as it allows the establishment of a common framework for comparison.26

There are other special research areas in Economics, such as Econometrics, but they are not considered part of economic theory and therefore do not follow the theoretical pattern developed in this paper. A more complex case is that of Macroeconomics: if it is understood as an investigation consistent with finding statistical relationships between aggregates, then the same remark as Econometrics applies. However, if it is about finding a microfoundation for macroeconomic relationships (Weintraub 1977; Barro 1993; Prescott 2016),27 then it follows exactly the same pattern proposed here.

The influence of certain areas of extra-economic theory praxis—such as the use of concepts, scientific models, techniques and methods imported from Physics (Mirowsky 1989), Mathematics (Weintraub 2002), Biology (Witt 1999), Cybernetics (Mirowsky 2002), etc.—is not relevant to the effects of the structure of this analytical framework.28 It

26 We are leaving out of our exposition other important theoretical developments, such as behavioural and informational economics as institutional economics. As far as they share commonalities with Neoclassical economics (as is, for example the case of Stiglitz (2000, 2002), Kahneman (2003), Williamson (1985), North (1990)), game theory approaches (Ostrom 1990) or evolutionary economics (Hodgson 2004; North 2005), we assume that they are included in our analysis.

27 For a critic on the current status of macroeconomics, see Solow (2008) and Romer (2016).

28 While it can have a strong influence on the content of $S1$—and therefore of $L$. 
is in the non-axiomatized elements of the models that the fundamental part of the agents, plans, areas and modes of interaction, etc., resides.

4. Concluding remarks

Under the presented analytical framework, the essence of theoretical progress consists primarily of further explaining phenomena or processes related to theoretical questions. Obviously, some gain in the explanation of phenomena or processes always occurs as a result of methodological extension exercises. However, the standard that guides the dynamic of progress is to ask questions that constitute a request for explanation of phenomena or processes $\varphi$ and proceeds to provide an answer by developing new models or theories $T$ by adding properties, qualifications or new information to the statement systems $S_1$ and $S_2$, leading to new laws $L$.

Tables 1 and 2 illustrate how the approach proposed leads to classify different economic theories-- and schools of economic thought- because all theories refer to the allocative process present in modern economic theories. From this point of view, the claim by Evolutionary, Austrian and/or Keynesian economists regarding the richer and more progressive nature of their approaches (compared to the Neoclassical paradigm) is meaningful. From this perspective, the superiority of Austrian economics over Neoclassical economics lies in (a) its capacity to explain a type of phenomenon that cannot be explained in terms of Neoclassical economic laws, i.e., entrepreneurship, and (b) within our analytical framework, this greater capacity is attributed to a better characterization of the economic agent, that is, in the richness and empirical content of statements $S_1$.29

Moreover, following this approach, theoretical progress would imply two types of activities. On the one hand, it is possible to build additional sets of statements within the

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29 It may be argued that a modification of $S_2$ would extend, in the sense of (b) above, the scope of application of economic laws implied by the theoretical allocative process. Thus, assuming the bounded rationality hypothesis (Simon 1955) would mean a more realistic analysis of economic agents’ behavior than Olympian rationality (Simon 1983). However, these hypotheses on “rationality” do not refer strictly to $S_2$: they are $S_1$ statements that obviously affect the way $S_2$ is present in the model.
same types of allocative processes, for example, considering agents with adaptive or rational expectations within Neoclassical models. On the other hand, it is also possible to build new kinds of allocative processes—which would imply new (of a different type, not just a different degree) sets of statements $S_1$ and $S_2$, for example, the case of a full microeconomic foundation of evolutionary economics. In the first case, an unbounded number of variations within the same allocative processes is possible a priori; however, for it to be a progressive practice, it is necessary that variations in $S_1$ and $S_2$ allow the addressing of unsolved (or partially solved) questions (i.e., $\varphi$ no longer belongs to the $D(L)$ implied by $S_1$ and $S_2$). However, it is also probable that these unsolved questions cannot be resolved within current theoretical allocative processes and that a completely new set (of a different kind) of statements $S_1$ and $S_2$ is needed, giving rise to new allocative processes and thus to completely new foundations and economic laws. This last alternative is progressive if it is able to extend the explicative capacity of the theory to account for real phenomena that were not previously explained.

References


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30 See for example Potts (2000) and Nelson (2013).


Dosi, Giovanni; Marengo, Luigi; Fagiolo, Giorgio (1996). Learning in evolutionary environments. Papers 9605, University of Trento, Computable and Experimental Economics Laboratory.


<table>
<thead>
<tr>
<th></th>
<th>Neoclassical</th>
<th>Keynesian</th>
<th>Austrian</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agents</strong></td>
<td>Consumers and producers react mechanically to</td>
<td>Asymmetry: consumers and producers as a</td>
<td>Human action with cultural (rules) and</td>
</tr>
<tr>
<td></td>
<td>changes in incentives (i.e.: prices)</td>
<td>mechanical devices whereas entrepreneurs have</td>
<td>cognitive dynamics (entrepreneurship)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the ability to make expectations</td>
<td></td>
</tr>
<tr>
<td><strong>Operational</strong></td>
<td>Pseudo-market (no true institutions)</td>
<td>Pseudo-market with “central authority”</td>
<td>Society/market as evolving processes</td>
</tr>
<tr>
<td><strong>environment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Type of knowledge</strong></td>
<td>Objective: both preferences and technologies are</td>
<td>Subjective: expectations (entrepreneurs).</td>
<td>Subjective: preferences and knowledge (tacit</td>
</tr>
<tr>
<td></td>
<td>known and well understood. Only change exogenously.</td>
<td>Objective: output-income and level of</td>
<td>or privative). Logic of discovery.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>employment.</td>
<td></td>
</tr>
<tr>
<td><strong>Presence of a</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes: but not necessarily all ends and means</td>
</tr>
<tr>
<td><strong>general</strong></td>
<td></td>
<td></td>
<td>may be expressed in this equivalent</td>
</tr>
<tr>
<td><strong>equivalent of value</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>(money)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Structure of the</strong></td>
<td>All the plans are consistent and compatible a</td>
<td>Plans not necessarily compatible a priori;</td>
<td>Consumers’ plans are always compatible but</td>
</tr>
<tr>
<td><strong>agent’s set of</strong></td>
<td>priori.</td>
<td>however all plans are compatible ex post</td>
<td>producers’ plans may contain some kind of</td>
</tr>
<tr>
<td><strong>plans</strong></td>
<td></td>
<td>(rationing)</td>
<td>incompatibility or inconsistency.</td>
</tr>
<tr>
<td><strong>Principle of</strong></td>
<td>Economic principle: optimization or</td>
<td>Economic principle: consumers maximize their</td>
<td>Economic principle: gents always select the</td>
</tr>
<tr>
<td><strong>economic</strong></td>
<td>maximizing behavior.</td>
<td>utility (firms their profits) given</td>
<td>best consumption or production plan.</td>
</tr>
<tr>
<td><strong>behavior</strong></td>
<td></td>
<td>rationing constraints.</td>
<td></td>
</tr>
<tr>
<td><strong>Agent’s allocative</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>process outcome</strong></td>
<td>Always efficient: consumers’ and producers’</td>
<td>Depends on the calculation of the</td>
<td>Depends on the operation of</td>
</tr>
<tr>
<td>(<strong>“economic law 1”</strong>)</td>
<td>plans render max utility or profit.</td>
<td>marginal efficiency of capital and</td>
<td>entrepreneurship.</td>
</tr>
<tr>
<td><strong>Social process</strong></td>
<td>General equilibrium and Pareto efficiency</td>
<td>Process of discoordination (ex ante) with</td>
<td>Process of coordination towards general</td>
</tr>
<tr>
<td><strong>outcome</strong></td>
<td></td>
<td>possibility of equilibrium in goods market</td>
<td>equilibrium of plans, but this state is</td>
</tr>
<tr>
<td>(<strong>“economic law 2”</strong>)</td>
<td></td>
<td>and disequilibrium (rationing) in labor</td>
<td>never attained.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>market (ex post).</td>
<td></td>
</tr>
</tbody>
</table>

**Table 1:** An example of the statements of neoclassical, Keynesian and Austrian economics. Adapted from (Rodríguez 2002: 345). Notes: Keynes explicitly refers to the work of a central authority in several passages of the *General Theory* (e.g., pp. 164 and 247). Due to the presence of long-term expectations, it may be that Keynesian entrepreneurs hold a set of intrinsically incompatible action plans.
<table>
<thead>
<tr>
<th></th>
<th><strong>Game Theory</strong></th>
<th><strong>Evolutionary Economics</strong></th>
<th><strong>Computational economics</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agents</strong></td>
<td>‘Players’ (consumers, firms, governments, etc.) with sets of strategic behavior</td>
<td>Heterogeneous agents (consumers, firms, etc.) with routines of behavior Routines (rules) may incorporate expectations</td>
<td>Artificial agents, heterogeneous with (different) rules of behavior. Rules may incorporate expectations.</td>
</tr>
<tr>
<td><strong>Operational</strong></td>
<td>Games. They may include ‘institutions’ as rules of the games or structures of payments.</td>
<td>Markets, industrial sectors, etc. (usually without “central authority”).</td>
<td>Artificial societies: networks, markets, etc.</td>
</tr>
<tr>
<td><strong>environment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Type of knowledge</strong></td>
<td>Objective (it refers to the set of actions and the structure of the game). Knowledge may be privative.</td>
<td>Bounded rationality. Subjective (preferences and technologies) and objective (output and other outcomes) Prative and tacit</td>
<td>Bounded rationality. Subjective (preferences, technologies, characteristics of the networks mechanisms of diffusion, etc.) and objective (output and other outcomes). Prative for each agent.</td>
</tr>
<tr>
<td><strong>Presence of a general equivalent of value (money)</strong></td>
<td>Yes, necessary to establish the matrix of payoffs, although these payoffs may be expressed in other terms than money.</td>
<td>Yes, usually in terms of units of output.</td>
<td>Yes: but not all means and outcomes need to be expressed in monetary terms31</td>
</tr>
<tr>
<td><strong>Structure of the agent’s set of plans</strong></td>
<td>Strategies (plans) are usually consistent and compatible a priori, but action may also be rationed.</td>
<td>Plans not necessarily compatible a priori.</td>
<td>Plans not necessarily compatible a priori.</td>
</tr>
<tr>
<td><strong>Principle of economic behavior</strong></td>
<td>Strategic behavior: maximizing payoffs.</td>
<td>Economic principle together with some kind of adaptive/selection mechanisms.</td>
<td>Economic principle: satisfying behavior (coping with thresholds, etc.).</td>
</tr>
<tr>
<td><strong>Agent’s allocative process outcome (“economic law 1”)</strong></td>
<td>Selection of the best actions given the nature (structure) of the game.</td>
<td>Adaptation to an evolving: disequilibrium dynamics.</td>
<td>Agents adapt their behavior depending of the feedback between their rules and the observed outcomes of interaction.</td>
</tr>
</tbody>
</table>

31 For example, in Schelling’s (1969: 488) segregation model, agents wellbeing depends on the proportion of agents of a different characteristic (sex, age, income, language, colour, taste, comparative advantage, etc.) surrounding them.
| Social process outcome ("economic law 2") | Nash equilibria, etc. Not necessarily Pareto efficient. | Processes of generation of variety, dissemination (discoordination), adaptation and retention (re-coordination); emergent orders. | Complexity and emergent orders. |

**Table 2:** An example of the statements of game theory, evolutionary economics and computational economics.