THE REPRESENTATIVE ECONOMIC AGENT – AN EPISTEMOLOGICAL APPROACH

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Abstract
The representative economic agent is an extensively discussed subject in the literature, in general, in the economic literature, in particular. The complexity of this subject inevitably makes it a point of intersection of several research areas - management, mathematics, computer science. The paper aims to reveal the most relevant ideas expressed, in time, by specialists who tried to capture and describe the representative agent. The theoretical approach, that we assumed, respects a temporal coordinate and allows us to finally formulate some relevant conclusions. The importance of the paper is given by the theoretical work to systematize some remarkable ideas on a subject which is still in the spotlight - the economic representative agent.

Key words: representative agent, game theory, rational behavior

JEL Classification: B3, B4, D1, E1.

Introduction
The representative agent issue concerned many specialists, from both macro and micro perspective. Subsequently, the representative agent became the subject of numerous research in Finance and beyond, if we consider the strong phenomenon of reality modeling from the essential element, participating in the economic life. Sophisticated analyzes involving collaboration with other sciences came to complete and support the theories about the representative agent: psychology, mathematics, informatics, statistics.

This paper brings into question this controversial topic of the representative agent. The study is a theoretical approach and follows a temporal coordinate. The main purpose is to observe, in time, the development of the representative economic agent, by considering the most relevant ideas and theories expressed in the literature. Inevitably, along with this approach a firm conclusion seemed to outline itself: the unstable and evolving economic environment, the difficulty to predict the behavior of individuals and also influenced by multiple factors generated, in time, a different picture of the representative agent, from a simple to a very complex one. The theoretical approach begins with a brief overview of the traditional ideas regarding the representative agent and then continues with the modern approach, with criticism and a personal vision upon the addressed issue.

The literature related to the theme can be synthesized by several works of interest belonging to the following authors: Adam Smith, John M. Keynes, Francis Y. Edgeworth, Alfred Marshall, Robert E. Lucas. From the perspectives of other theories such as the game theory, combining elements of mathematics, logic, computer programming, computer modeling, new voices have been heard: John von Neumann, John Nash, Herbert Simon, Axel Leijonhufvud, Alan P. Kirmani, James E. Hartley, Victor Ríos and Rull José.

The representative agent in a traditional view
A well-known practitioner of the financial world enunciated an interesting idea, that thinking can not catch up with reality as this is always broader than human understanding, so that reality captures the ability to surprise human thinking and the last one captures the ability to create reality [14]. In this context, addressing the notion of representative economic agent does not intend to catch up to reality but it is an attempt to analyze to what extent we can extract information from the microeconomic to the macroeconomic level, in order to draw some relevant conclusions. In the same paper, the author drew attention to another idea, namely that social and economic events, as opposed to events concerning physicists and chemists, involve participants that can change the rules of economic and social systems with their own ideas about these rules [14]. The capacity to capture, to fix or to frame these participants at a certain time, through research and intuition, have resulted in important works of scientific value.
Of a particular utility in understanding the development of representative agent is staging its existence and identifying the main forms in which the history immortalized him along with essential changes of culture, society and economic thinking.

Great philosophers of classical political economy (Adam Smith, Thomas Malthus, David Ricardo) and its criticism (Karl Marx) studied capitalist society after the three categories that inspired it at the time: workers, capitalists, landowners. The classical political economy agent was the class representative individual: the worker trying to survive with the salary received, the capitalist which built his welfare from the exploitation of workers, the lazy landlord which consumed his lease with many and unproductive servants.

The continued development of the capitalist world meant, in the economic theory, promoting another representative individual: the rational economic consumer of neoclassical theory. This new man gathered the characteristics of the three social classes mentioned above: he was a worker (in one form or another, physically or intellectually), he was a capitalist (holding at least a share dividend or other value generating a certain non-work income) and could even be a landowner. By the virtue of his thinking, rational consumers had the right to choose where to invest their financial resources, in one direction or another, to transfer the well-being from present into the future. As critics have noted in the twentieth century, the rational consumer had supernatural powers: the capacity to collect and integrate a huge amount of information on investment opportunities, market exploration and company management, so that he could quantify the actual price of financial assets; the capacity to choose from the millions of goods on the market the ones which were maximizing his utility and purchasing power. The rational consumer was, more or less, the starting point for most research related to the concept of representative agent in the twentieth century.

The First World War marked a major boost to certain elements of economic thought, including the representative agent. Surprised by J. M. Keynes, in his works, the representative agent is much more cautious, sensitive to negative news, with a preference for liquidity when waters become turbulent in the economic environment. If rational economic agent could daily make correct assessments of profitability on investment objectives and to manipulate market, the representative agent of Keynes was a speculator one trying to guess what others think that will be the average opinion. Keynes proposed a different typology (Clever Civil Servant) – the intelligent public servant. This manipulator could make appropriate and profitable investments to provide employment, to improve the quality of life till the cancellation rate profit (close to zero), when the average standard of living in industrial-capitalist societies was high and people could daily escape from the survival anxiety.

Of a great importance was the contribution of the economist, mathematician and statistician Francis Edgeworth who used the representative individual concept in his works [1]. Later mathematician and economist Alfred Marshall used the concept of representative agent, in his "Principles of Economics" to analyze the offer, namely to overcome the obstacles posed by the diversity and changes in the manufacturing companies size in an economy.

The representative agent in a modern view

World War II captures the representative economic agent in two figurative pictures: a pilot trying to avoid collapse and a soldier charged with shooting down airplanes [2]. This dramatic contradiction attracted the mathematicians and physicists attention, especially the one of John von Neumann, who made an impressive analysis of human behavior and the possibility of its anticipation. In order to shoot down the plane, the soldier had to move the gun to the place where the plane should have been at a certain moment in time. Similarly, the pilot had to fly so that it could have been very difficult to predict its next position. Simplifying, both pilot and soldier actually had two choices: left or right (if they have made the same choice, the pilot would not have escaped, if not the pilot would have escaped). John von Neumann called this the zero-sum game between two people [2]. The winner was the one who first predicted the specific behavior of the opponent, in order to exploit it. The human behavior appears as an exploitable element. Moreover, instead of studying the bond between behavior and tastes, experiences, knowledge, von Neumann proposed to analyze the link between human behavior and technical mechanisms, computerized forecasting and simulation.

Only a few years after the appearance of game theory and economic behavior, John Nash offers an essential doctoral thesis which proposes an alternative to the von Neumann analysis program of general conflict situations. Nash suggested to use mathematics in order to analyze all cases of strategic interaction. The condition was to anticipate the enemy’s movement, in order to optimize its own strategy. The opponent, in turn, equally determined, tried to find out what will be the next move of the other. He always maintained that in a large number of games, there is at least one pair of optimal strategies in response to each other, these pairs being the "Nash equilibrium". Thus, the representative economic and rational agent gain a strategic analyst status [2].

With the end of World War II, Herbert Simon, in the spirit of the institutionalism tradition, revealed the artificially knowledge of the rational economic agent, starting from the way of taking decisions by those individuals with important positions and public responsibility. The representative agent of Simon was a person with solving problem skills, intuition, knowledge, preferences, although the complex reality would not have been
revealed itself [2]. For this reason, the rationality of this representative entity was recognized to be limited, transforming him into an ultimately processor of information with limited aspirations to achieve the optimum. Today, a representative part of economic literature studies the models in which agents with limited rationality can be observed in their interaction, by computer simulations in a virtual economy laboratory.

Critics of the representative agent concept

From the beginning, the concept of representative economic agent, which required an abstraction but also offered applicability, was strongly criticized. One of the most important criticism was the Nobel Prize winner in economics, Robert Lucas Jr., who argued that judgments based on macroeconomic data can neglect major changes of the past and also the changes in the economic agents behavior, in new market conditions, changes that summed could actually modify the macroeconomic reality [10].

The proposed solution consisted in a model in which a change of one aspect of the economic policy should be the starting point in reconsidering the decisions of each agent and then, through aggregation and in new conditions, it should be determined the effect of that change in macroeconomic terms. Specifically, the author argued that if we want to predict the effect of changes in the economic policy, we need to update the old macroeconomic model parameters (depending on preferences, technology, resource limitations, and so on) that govern the individual behavior. Forecasting how each trader would act under the new conditions, through aggregation, it would be calculated the effect of changes in the economic policy.

The Philips curve also was subject to criticism. Practicing an inflationary policy, in order to reduce unemployment, generates in the companies forecasts about growing inflation which can alter the hiring decision. History has shown that if, in the context of monetary policy in the early years of the twentieth century, inflation was associated with low unemployment, not the same thing could have been argued in the context of current reality and monetary policy.

Other important criticism came from researchers James E. Hartley and Alan P. Kirmani, the latter concluding that reducing a mass of heterogeneous entities in a representative agent was not justified and might lead to misleading or often wrong conclusions [7]. An alternative to the representative agent could have been, in this context, the agent-based simulation models that could have worked with a variety of agents or stochastic general equilibrium models, built on the study of micro-level interaction between economic, rational and different agents - DSGE models [12]. Author James E. Hartley criticized Marshall's idea according to which all management actions determine the market price to equalize the cost price of the representative firm, on the premise that managers have different skills [4]. Schumpeter himself in the "Ten great economists" paper, in the section dedicated to Marshall, wrote that the representative agent is one of the most deceiving tools with more hides than removes some logical difficulties faced by economists.

Another radiography of the representative economic agent

The desire to forecast, as a specific feature of economic field, is based on two important assumptions: on the one hand, the economic phenomena arise from individual actions and, on the other hand, all these small and quantified individual actions are aggregated and statistical expressed by indicators.

Economic theories came from the study of statistical aggregates through specific causal relationships between these at the macroeconomic level and also from the understanding of small individual actions (microeconomics). At this level, the researcher was forced to turn his objective upon a world in a constant change, with moving individuals, similar but still very different in their analyzed characteristics.

The microeconomic approach required the using of a representative economic agent concept, a decision maker of the economic reality that actually generates by his behavior and relationships the macroeconomic information and statistical aggregates. The risks assumed by this approach were soon revealed but the importance of explaining a variety of economic phenomena, through the representative agent, defeated if not totally, at least partially, the opposition of other theorists. As long as research started from clearly set out assumptions, even restrictive by choosing this representative agent as a base for microeconomic phenomena, results have not lost value but were the target of criticism.

General equilibrium macroeconomic models based on the concept of representative economic agent have been greatly simplified, being very important in developing new theories with a significant higher difficulty, with heterogeneous and different economic agents, as subjects to current research and great capacity in capturing reality at a higher degree of complexity.

Today, the representative agent is a starting point, a very useful tool in the economic studies, and can be a consumer, a producer or both. The supply and demand curves are just two examples of aggregation applications of individual offers, on the premise of this essential existence of representative individuals.

According to the logic, an economic model has a representative agent if all agents of the same type are identical. According to other opinions, the agents of the model may be different but if the sum of their decisions is mathematically equivalent to a single individual or all identical individuals, then the economic model also has a representative agent. In both cases it seems that reality is very complex but can be simplified. The set
assumptions (if all agents of the same type are identical, if the sum of their decisions is mathematically equivalent to a single individual or all identical individuals) proved to be more than illusory, especially in the current world where there is a permanent change of values, concepts and behaviors. Moreover, one can formulate a pertinent question: are there homogeneous or identical agents in a world of permanent local interactions and continuous information asymmetry?

The answer is simple and predictable: no. The representative economic agent is a fiction, an imaginary element used by theorists to formulate and explain the studied phenomena. Even so, in theory, the representative agent was not and is not a unitary concept, a clear and consistent image over time. Furthermore, due to the diversification and development of socio-economic reality, the level of abstraction of this representation increased, being even harder to capture the essence of economic behavior in a constantly adapting movement. The representative economic agent can be a person, a company, a household and even a nation, depending on the object selected in the research and modeling requirements. Sometimes the representative economic agent as a person or individual acquires some conflicting features (when studying the differences between today’s preference for future goods and the real preference for the same goods after it reaches the certain moment in the future).

Despite criticism, the representative agent survived and, even more, returned to literature as a first assumption of economic research, not because in time there were solved the criticism. The notion of representative agent remains abstract. There are many questions whose answers may problematize rather than the question itself. What does it mean to be representative? Representativeness is equivalent to medium term? Representativeness as a medium value may be insufficient and risky because there can be lost important information and an agent labeled as a medium individual, once acknowledged his position is unlikely to remain in this condition and not try to evolve, while the competition is growing.

The typical representative agents described in the literature, some listed in the previous section of this paper, can not be clearly separated in time. Human nature is very complex, the economic and social reality also, time by its conjunctures removes or inhibits certain characteristics, features (exacerbates or minimizes them, but that does not mean they do not exist) and for these reasons, it is a bold action the attempt to define strictly, in time, the representative agent.

Reality showed that people often act irrationally, wrong. However, the difficulty of replacing rational economic agent with the behavioral dominated one is big, because of the complex played roles and capabilities, learned and assumed by the first one are superior and indispensable in the conducted research. In the last 25 years, along with important discoveries in psychology and socio-biology, the representative agent becomes an entity with a behavior that neoclassical economists and advocates of Nash's ideas considered to be irrational. An illustrative example is the final game between two persons, one that proposes and one that responds to the proposal. The proponent is allocated a sum of money, for example $ 10, which he needs to share with the second player on his initiative and offer. If the latter accepts the offer, both get their share, otherwise neither of them will receive nothing. The second player, according to Nash's judgment, should accept any offer than nothing, and the first player, being aware of it, should propose a minimum amount possible. However, experiments have shown that 20-40% of respondents refuse offers which tempt the bidders to increase the amount offered (it was noted that respondent's refusal might come from a desire to punish the bidder that violated their rights) [2]. The rational economic agent, pursuing the material fulfillment, do not act in this way.

The relationship between the elements of a system (like agents in the field of microeconomics) and the aggregate behavior of the system (reflected by macroeconomic information) is indirect and subtle, in a certain percentage even independent. Thus, the rational economic agent is in the position of an implausible entity as an information processing system, due to his limitations in thinking and in other affective components and at the same time it is possible that macro-behavior might not be a reflection of his behavior.

The transformation of an entity in a computerized mechanism of thought was based on significant research in the social sciences over the past 50 years. Human society is conceptually and mathematically transformed into a form of a complex system of classes and thus seeks regularities, features that can describe social phenomena. The basic idea is the notion of own – organized complex systems, the trend, the permanent movement, different form the equilibrium of the representative agent’s world. An example of own – organized system comes from the thermodynamic systems which, although with well-defined temperature and pressure, the molecular component is in a continuous flux.

In other words, the place of the economic agent was taken by the algorithm agent [8]. The strong desire of financial gains attributed to the economic agent, in the view of neoclassical and marginal economists, is reexamined, criticized and transformed into the ultimate goal of gathering and processing information. However, based on these findings, more and more researchers proposed a new agent: that nurtures the desire of financial advancement and the inclination to reward qualities and punish defects and dishonest behavior.

Even so, the previous view is an optimistic one. The current economic climate created by those with very unfair and opportunistic behavior, expressed in various forms, suggests another idea. Niccolo Machiavelli himself expressed it frankly: the scope justifies the means. Of course, financial accomplishment was certainly an
objective of economic agent, perfectly rational or limited. But today, under a fierce battle for limited resources of any kind, the means are inexhaustible.

Conclusions:

The representative agent today can be considered to be the American corporation. Originally created as an association of people with well-defined and positive purposes for the community, after 150 years of existence, the corporation obtained the same rights as human beings with unlimited powers and hard to control. There are few voices, official and unofficial ones, crying about the unfair practices adopted by them: exploitation of cheap labor in poor areas of the world, disinterest in the natural environment (by massive pollution) and hence to the social environment (if we think of health disorders due to pollution). Multiple cases of fraud detected by misleading statements inconsistencies, lack of guilt, all with the ultimate goal of financial enrichment, put into the spotlight a representative agent dominated by the desire to get more money. Of course, there's nothing new in this statement if we think that this was a permanent feature of the economic man, to a lesser or a greater extent but, today, the costs of such a behavior are superior. It is a pessimistic but perhaps a closer view to reality.

If we ask what the future holds for the representative agent, we can answer by another question: will he exist in the future? As long as the macroeconomic phenomena will be studied and analyzed by statistical data collected at the individual or micro level, we consider that the existence of the representative economic agent is essential. Moreover, his theoretical existence is due to the real existence of economic agents. His positive or negative image, as a relative and imperfect reflection of reality, can be a warning for the economic society at a certain time.

Finally, if the representative economic agent reflects the essence of what exists and manifests itself in the economic reality, another question arises, assuming the mentioned idea that thought can create reality: what should be the ideal representative agent like? The answer could be, if we refer only to a legal entity - any firm headed by a professional individual, well trained in its activities with foresight and self-control and, why not, with that responsibility manifested in business, social area and in the environment.

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