PARADIGMS OF THE ECONOMIC GROWTH AND THE ECONOMETRIC MODELLING

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The economic sciences have reacted to the renewal challenge of of the research and analysis methods, increasing their patrimony with paradigms which have been validated over time.The main pursuits of the modern world such as: the economic dynamics and stability, the economic oscillations and cycles, the efficient allocation of the resources, development economy, general balance, etc., have got more solid answers using the systemic approaching and econometric modeling, using the decision foundation of adjustement and self-adjustement based on the human behaviour, using the optimal control theory and the information technology.

Key words: economic growth, sustainable development, econometric modeling

The concept of *economic growth* implies many approaches and points of views. *Simon Kuznets,* the Nobel Prize Laureate for economics in 1971, stated that "the economic growth of a country may be defined as a long-term increase of the capacity to supply people with diversified goods; this capacity increases if it is based on advanced technology, and institutional and ideological adjustment"[120].

From the classic economic theory (1750-1850) and to the Marxist, Keynesian and post-Keynesian theories, there have been constant concerns to solve the problems of economic growth. From *Adam Smith*'s concept of "national riches" or *Joseph Schumpeter*'s "theory of economic growth", to the latest theories as "the terms of economic progress" (*Colin Clark*), "the technological changes" (*Robert M. Solow*), or "the modern economic growth" (*Simon Kuznets*) there has been a long conceptual evolution in this field.

Considering the present realities, the process of economic growth may be seen from two points of view. The economic growth refers *generally* to all macroeconomic changes (positive, negative, zero) that occur in a certain space and time. The economic growth consists *particularly* in the quantitative increase of activities and results within the national economy and its different subsystems, correlated with the factors that contribute to this increase.

The economic growth indicators are macroeconomic indicators that refer to the macroeconomic outputs. One should notice that only the positive general sense of the process of economic growth is used, although the terms negative or zero economic growth are used conventionally.

The essence of economic growth could be expressed better by a comparative analysis with other relevant processes for the macroeconomic dynamics, as the economic development and the economic progress.

The *economic development* refers to the quantitative, structural and qualitative changes of the economic processes, scientific research, manufacturing techniques and technologies, economic mechanisms, and human attitude, thinking and behaviour. The economic development implies the economic growth and there is a *relation from whole to unit* between these two processes: the economic growth may exist without development, while the reverse situation is not valid.

On the other hand, the *economic progress* is the temporary effect of economic growth and development. The economic, scientific, and technological progress is the base of general economic growth. In fact, the economic progress represents the increase of national productivity, the increase of economic potential and the modernization of economic structures.

Economic growth and development have gradually become more complex processes, influenced by many factors which (analysed by the specialists) generated new explicative models of the macroeconomic dynamic processes. Therefore some derivate concepts occurred: *the economic growth with technical progress; the economic growth with a powerful military sector; the model of economic growth opened toward the international economy; the economic development focused on environmen*t. In the consolidated

economies, the economic growth and development are vitally supported by information development, because the *informational society* represents their present and future.

Nowadays, a new concept of economic development has occurred, a concept of wide audience at all levels, namely the *sustainable development*. The sustainable development is used as a synonymous term for the viable, sustainable economic development, and the human and ecological development. I may state that the sustainable development implies the economic growth in accordance with the requirements of ecologic balance and human development (culture, science, civilization, equality and equity between people and nations, equal chances for all generations).

The Report of the United Nation Committee for Environment and Development present by the prime minister of Norway in 1987, introduced for the first time the term of sustainable development – that development that does not harm the environment.

The sustainable development integrates the environmental and demographic reasons with the strategies of economic development to provide a relative and dynamic equilibrium between economic growth, cultural development, technical and scientific progress and environment protection. Therefore it meets the requirements of social development. The concept of sustainable development deals with some problems and features specific to the economic growth of the latest decades, as the ecologic, technical, scientific, cultural, demographic, military dimensions and their multiple interdependences. The sustainable development deals with all of them, but on a higher level, and it may become the object of some coherent strategies of solutions.

The applicative research launched the concept of structural economy as the background to accomplish the scenarios of sustainable development, regarding mainly the technological and life quality options.

The present main concerns – the economic evolution and the stability problem (*P.A. Samuelson*), the economic fluctuations and cycles, the efficient resource distribution (*Kenneth J. Arrow*), the development economy, the general equilibrium (*Kenneth J. Arrow*), etc., have received more consistent answers by using the *systemic approach* and the *econometric modelling* (*Ragnar Anton Kittil Frisch*), the adjustment and auto-adjustment decisions based on human behaviour studies, the theory of optimal control, and information economy (*Kenneth J. Arrow*).

There are creative ideas from cybernetics in economic and social sciences. For example, the following few features of economics evolution demonstrate this statement.

Economics had over 250 year history when the third millennium began. As the natural sciences, they developed in a Cartesian way, according to "the rules of mind guiding" or "the speech about the method that controls the reason and seek the truth in sciences" written by the great Rene Descartes[121] (1596-1650) more than 370 years ago. At the middle of the 19th century, John Stuart Mill (1806-1873) stated in his well-known study "Economic Principles" that the general theories of value and price had already been completed by that time[122]. The error comes from the classic theory of value that determined the price level only through the production costs, neglecting the subjective element - demand.

One should notice that even the antique philosophy stated that "man is the measure of all things" (Protagoras 481- 411 î.e.n.)[123], and more recently Bergson[124] states that "the living being chooses or tends to choose"; its role is to create and therefore an undetermined area occurs within a world where everything is determined.

The economic theory was then (1870-1890) entirely renewed on this matter by the economists of the Austrian School, headed by Karl Menger. They made sustained research of statistic data regarding the human needs and introduced demand in the theory of prices. Important contributions on this matter were made by other neoclassic economists: Leon Walras, Stanley Jevons, Alfred Marshall and others. The neoclassic theory (1870-1900) took and perfected many classic ideas. The break between classic and neoclassic comes from the importance granted to production and consumption. Marshall criticised Ricardo's indifference (he was concerned only with production, cost, etc. and neglected the customer's wants and needs). The neoclassic theory of value based on utility included the customer and his/ her demand. The classics did not agree upon the theory of value and work.

Based on the new paradigms introduced in the economic theory by the neoclassic researchers, new mathematic models occurred. They start from the individual rational behaviour and go to the general equilibrium that represents all individual optimum.

These theories did not face the economic realities because the statistic data were poor. Only in the first half of the 20th century, the theory was checked using some observations, and therefore economics entered a stage in which the quantitative analysis become part of it. From this evolution point forward, the economic concepts can be measures and included in an interdependence system that opened the way to the *econometric modelling*. Ragnar Anton Kittil Frisch is considered one of the parents of the modern econometrics. He stated that the terms of "econometric" and "econometrics" include both pure economic elements and statistic control of the pure economy's laws, a fact that is entirely different from the simple empiric use of statistic data and economic phenomena[125].

Nicholas Georgescu Roengen[126] is more reticent in appreciating the success of economic thinking evolution. In his book, "The law of entropy and the economic process" he states that economics is mechanistic (from the point of view of the classic mechanics) and therefore the economic process induces no qualitative changes and is influenced by the quality of environment it operates in. In his opinion, the neoclassic researchers neglected too easily the natural resources from the structure of the economic process. Though physics developed another branch (the thermodynamics) and a new law (the law of entropy[127]), the economic theory did not react and reconsider its mechanistic characteristic.

The law of entropy is the second principle of thermodynamics and represents the most economic law from all laws of nature. It was taken by the economic theory as a measurement instrument, using a relation from the information theory.

Generally, the entropy is an indicator of the relative quantity of connected energy from an isolated structure, or more precisely, an indicator of the uniformity degree the energy is distributed in such structure. Therefore the high entropy means a structure in which all or most energy is connected, a structure where the opposite is valid. In fact, the law of entropy states that the universe entropy (or of an isolated structure) increases permanently and irrevocably or the free energy decreases continuously into connected energy. If we accept the hypothesis that the free energy is an ordered structure and the connected energy is chaotic, one may state that there is a continuous turn of order into disorder in the universe. The law of entropy does not state that the qualitative degradation is exclusively connected with the useful work of the intelligent beings, but it produces itself, no matter the free energy is used or not.

The change from mechanic physics to thermodynamics generated also the probabilistic approach of the causal relation. John von Neumann[128] stated that this relation is the effect of the law of high numbers and it is independent of causality or of lack of causality of the natural laws that govern the elementary processes. In consequence, there is an essential difference between forecasting an essential element and forecasting more elements as a whole.

Therefore one should admit that in nature there is factor that combines dialectically order and disorder, according to the law of high numbers. In consequence, the hazard is the reason and the law of high numbers is its effect. If this statement is valid, then the anti-hazard should act in nature[129]. If the law of entropy applies in an isolated system, then man changed the system's entropy.

Starting from these arguments, it is advisable to use the quantitative analysis and especially the random value models in economics.

The statement from the "The law of entropy and the economic process" according to which "economics should be based on dialectic reasoning in order to be not only the science of observable quantities, but also the science of man" is eloquent. The following statement also supports this: "the role of arithmomorphic models is to facilitate the discussion, to classify the results and to save us from eventual errors of reasoning". The Nobel Prize Laureate for economy in 1974, Friedrich August von Hayek[130], noticed that the main problem is to understand how people think and act.

The successes of mathematics' use in economic theory and practice generated distinct approaches, also known as econometrics, economic-mathematical analysis or quantitative analysis. The model, as a form to represent reality, meant to know the behaviour and control of the real systems, has become an essential concept in economics. Each model is subordinated to research and therefore its Gnostic value depends on the mathematical theory, and especially the economic theory. The modelling of economic growth included new ideas of the economic and mathematical theories. There has been a gradual passing from the ideal to the experimental or econometric models, from the aggregate to the disaggregated models, from the static to the dynamic models, etc.

The modelling of economic growth included the input-output analysis and generated a qualitative leap toward the structural approach. The attempt to establish some macroeconomic policies for the developing countries based on the neoclassic models of economic growth showed "the structural rigidity" of these macro-systems. P. Richard Agenor, economist with the World Bank, states that: "the neoclassic theory proved to be unable to explain satisfactory the great differences between the production increase per inhabitant in the world"[131]. Therefore some flexible policies are needed and they cannot be analysed through neoclassic models.

In an uncertain world, with structures and connections on the fly, the quantitative analysis and the logical structuring of the market economy must be better considered, and the quantitative analysis should develop strategies of econometric modelling.

In the developing countries and the countries in transition to the market economy, the macroeconomic policies should take into account the social and economic state, characterized by a high rate of population growth, a low income per inhabitant, a small volume of investments in both productive capital and registered capital, and infrastructure. In addition, the technical and economic limits of an effective use of resources are the results of the lack of financial capital, technologies, know-how, human capital deficiencies, etc.[132]

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