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ECONOMICS. A BIO-ECONOMIC APPROACH

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Abstract

Recently, a series of heterodox economic trends (bioeconomics, ecological economics, behavioral economics, neuroeconomics, etc) have become more and more present in economics (even more, due to the coming and the development of the unprecedented economic crisis).

Moreover, the revival of the evolutionist economic science from the last two decades has brought a significant contribution to the theoretical development and an important interdisciplinary and/or crossdisciplinary import.

The bioeconomic approach becomes necessary due to the worldwide ecological crisis which closely affects almost all the sectors of our industrial civilization.

Having the work of Nicolae Georgescu-Roegen, the father of the bioeconomic science, as guidelines, we consider that the Romanian economic science should focus more on the study of the oportunities offered by this new direction.

Key words: bioeconomics, entropy, sustainable growth

1. An evolutionary perspective of economics

The evolutionary perspective of economics aphas been approached by an increasingly large number of economists in recent years [3].

As the **forerunners** of the idea of evolutionary economics, we can mention *Marshall* with his most frequently quoted aphorism 'The Mecca of the economist is rather the economic biology then the dynamics of economics' and *Veblen* with his question 'Why economics is not an evolutonary science?'.

The evolutionary thinking in economics provides us with a variety of

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3 Jinaru, A. (2010), Finanţarea inovării în economia globală bazată pe cunoaştere, Teză de doctorat, ASE Bucureşti.

perspectives and in this respect, *Hodgson* identifies six main groups of authors[4]:

- the works of some economists such as *Smith, Marx and Marshall* are occasionally mentioned as 'evolutionary' by its very nature;
- Schumpeter's followers describe their work as being all of 'ecological economics';
- *the Austrian school* is often presented as 'evolutionary' and it i decisively influenced by the works of *Menger, von Mises* and *Hayek;*
- *the Institutionalists* in the tradition of *Veblen* and *Commons* describe their approach as being of 'evolutionary economics', considering in general that the terms 'evolutionary' and 'institutional' are almost synonymous;
- *the evolutionary game theory*, developed in the mathematics of economics having as precursors *Maynard-Smith* and *Axelrod*;
- *The work developed by Santa Fe Institute* in the U.S., targeting applications in economics using the models and the tools of the complexity science.

2. Bioeconomics or the bioeconomics science

Given that the economy, the economic activity is influenced decisively, in addition to intentionality and human behavior and biophysical background, the economic science should not remain confined in a rational reductionist reconstruction as the economic theory from the main trend is in general. A broader approach requires bridges to other disciplines (history, philosophy, politics, sociology, psychology, science, etc.), and heterodox approaches as well[5].

Bioeconomics is the science that seeks practical, genuine reconciliation between the Western economic culture as modern economic science, and the biology, the science of life.

So, the bioeconomics is the discipline that originated in the synthesis of biology and the science / theory of economics and which aims to integrate 'the *empirical culture' specific to biology* and 'the *formal culture and / or the literary' specific to the science / theory of economics*. Basically it overpasses the sectoral approaches of the sciences of the environmental-economic interface, and natural resource economics or environmental economics, environmental or economic theory[6].

From a pragmatic point of view, bioeconomics is the science that aims to determine the threshold of economic activity (the wider approach is socio-economic) to the biophysical (biophysical system) substrate (background) on which it can be used effectively and efficiently without destroying the conditions for its regeneration, or, in other words, the threshold of sustainability.

The bio-economic activity has as model the biophysical processes of nature, such as the evolution, co-evolution and cooperation, natural selection, conservation,

4 Hodgson, G. (1999), *Evolution and Institutions*, Massachusetts: Edward Elgar Publishing.

5 Jinaru – idem.

6 Jinaru – idem.

regeneration and recycling. Considering this approach, the *bioeconomic activity is not only the re-production, exchange, consumption, but also change, transformation (qualitative) and innovation*.

3. The main bioeconomic trends

The relationship between the economic science and biological science (between economics and biology) has evolved and has become increasingly more complex over a century and a half.

The economy itself, in its biophysical aspect, i.e. the process of production, distribution and disposal of natural resources, is no exception, the thermodynamics and the evolutionism allows us to isolate living being from the environment today. Therefore, we are witnessing a co-evolution, by the mutual interaction of the biological evolution and the changes in the planetary environment.

The international economic development, accelerated by the growth of the population, the consumption of resources and developments in technology are the focus of an unprecedented crisis faced this time, amid the growing techniques' illusion that neglect or contradict the second principle of thermodynamics - entropy[7].

The dialogue, interactions and the interdisciplinary transfers have diversified throughout history, along with the sophistication of the tools and methods of scientific research, from a simple inspiring metaphor (biological organics in response to the physical mechanics), the biological analogy, by analogical reasoning, to model and / or the explanatory mechanism (the universal Darwinism).

While reviewing the trends, we can say that through **Nicolae Georgescu-Roegen** the **bioeconomic** trend arises, whose promoter is the current focal point of converging and bio-synthesis of various aspects present in a lesser extent from various authors and integrated in his bioeconomic theory (in our opinion still unrivaled theory, but also through a bioeconomic programme which has never been applied). This trend has been an inspiration for other trends of this type which occurred in the last decades.

Thus, such a current is the biophysical economics - which is based on a conceptual model that sees the economy connected and supported by a flow of energy, raw materials and ecosystem services. Practically, the biophysics economics connects the economic theory to the biophysics of reality; the perspective is of a thermodynamic approach of the economy and focus on the production of goods and services. Among the most important authors we can mention *Ayres, Cleveland, Costanza, Gowdy and Mayumi or Hall and Klitgaard* [8].

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7 Popescu, G.; Filimon, R. (2009), *Nicholas Georgescu-Roegen, Epistemologia evoluționistă*. Săgeata timpului, Ed. Risoprint, Cluj, Napoca, p. 237.

8 see Ayres, R. (1978), Resources, Environment, and Economics: Applications of the Materials/ Energy Balance Principle. Wiley-Interscience, New York; Cleveland, C.J. (1987. Cleveland, C.J. (1987), Biophysical economics: Historical perspective and current research trends. Ecological Modelling, 38. Gowdy, J.; Mayumi, K., Bioeconomics and Sustainability: Essays in Honor of Nicholas Georgescu-Roegen,. Edward Elgar Publishing, Cheltenham, England..Hall, C.; Kent, A.K. (2006), The Need For A New, Biophysical-Based Paradigm in Economics For The Second Half Of The Age Of Oil, International Journal of Transdisciplinary Research Vol. 1, No. 1.

The Ecological Economics - is another trend occurred in the early 1980s following the pioneering work of *Roegen, Boulding, Constanza and Daly* and outlines the interdependence and the co-evolution of the human economies and the natural ecosystems in time and space; the green economy aims to base the economic thought and practice in the physical reality, especially to the laws of thermodynamics and the savvy of the biological systems and promoting sustainable economic development / sustainability as well.

The **bionomics** trend - defines the economy as an evolving self-organized ecosystem, as a way to bring the economy (the technosphere) in harmony with the ecosystem (biosphere).

Finally, the trend given by **the evolutionary (artificial) economic games** - whose starting point is in *Smith's* work, the concept of 'evolutionary stable strategy' and 'evolutionary game theory' is introduced. By applying the mathematical theory of games in biological contexts, unlike the classic theory of games, the focus is here on the dynamics of changing the strategy and not necessarily on the properties of the equilibrium strategy[9]. The evolutionary game theory by its interdisciplinary developments in recent years, provides a conceptual basis for analyzing the choice in the presence of strategic interaction. Beyond a more appropriate modeling of the interactions between the agents, the evolutionary game theory helps to redefine the concept of economic rationality.

4. *Nicolae Georgescu-Roegen* – the father of the bioeconomics

Nicolae Georgescu-Roegen is one of the few great economists of the world which is recognized both for its fundamental contribution to the mainstream of the economic analysis, and especially for his pioneering contribution, the founding father, the initiator of a new vision, a new approach, a new economic paradigm, namely the bio- economic science [10].

Nicolae Georgescu-Roegen is considered the father of bioeconomics. Through his works *Analytical Economics: Issues and Problems, The Entropy Law and the Economic Process, Energy and the Economic Myths, Institutional and Analytical Economic Essays, La Décroissance: entropie-écologie-économie*, to name a few, Georgescu-Roegen founded the broad scientific theoretical framework that would change the way of economic thinking and action.

Starting from the dynamic model of classical political economy thought, whose roots must be sought in the medieval space, *Roegen* shows that it is based on growth - without irreversibility, without time, without complexity, without creative destruction

9 Jinaru – idem.

10 Georgescu-Roegen, N. (1971), The Entropy Law and the Economic Process, Harvard University Press, Cambridge Mass.

and therefore, without the possibility of evolution and renewal[11].

Without refusing the accumulations [12], especially from a theoretical point of view, *Roegen* proposes another way of political economy and but also an economic policy revolution in view of thermodynamics, completed by his discovery of the double energy (first principle) and entropy (second principle). Compared to other economists who sought economic equivalent to entropy, *Roegen* directly argues that the economic systems exist in the real world of physics and therefore, we must comply with the law of entropy, as everything and everyone in this universe does.

The laws of thermodynamics and especially the law of entropy, tells us that the decrease of production is inevitable in physical terms. But this is not to say or to make us believe that it necessarily implies a decrease in the gross world product, much less, a decrease in the degree of satisfaction of people. This is a review of the concept of economic value production, able to create revenue using less material and more energy.

Indeed, an economic policy based solely on a strong reduction in consumption would generate (beyond the very probable final failure) given the current distribution of preferences, a drastic fall in global demand and, therefore, a significant increase in unemployment and social disparities.

We must therefore rely, *Roegen* states, on a different distribution of preferences for the inevitable and necessary decline of the physical quantities to meet the decrease in the value of production.

This implies, of course, a genuine reconciliation between the Western economic culture as a modern economic science, and biology, as the science of life and the outcome of this reconciliation - the bio-economy, in fact, a new science[13].

What is most interesting in *Roegen'*s view is the *equation of pleasure*.

If E is a particular pleasure of a man, we can write symbolically:

E = (the pleasure of consumption + the pleasure of leisure) – the chore of work

Symbolically, as in this equation the mathematical signs are not taken in the strict sense but rather as signs of convenience in order to summarize the imponderable elements contained negatively or positively in the entity on the left of the equals sign[14].

11 Georgescu-Roegen, N. (1971) – idem.

12 Roegen's scientific works were written first in the 'research program' (meaning the concept of 'research program' standard of mainstream economics). Gradually, he detaches himself from it and develops a new radical approach - bio-economy – of the economic phenomena, drawing and gradually constitutes a 'new scientific research program', which changes the paradigm of economic thought and even puts the foundation to achieve a revolution in economics.

13 Popescu, Filimon – idem

14 Georgescu-Roegen, N. (1979), *Legea entropiei şi procesul economic*, ed. Politică, Bucureşti, p.278

Roegen introduced the notion of *sustainable decline* or controllable decrease as opposed to liberal economy and the concept of sustainable development. He believed that the sustainable development endangers the natural balance of the planet because its resources are limited and non-renewable. He also believes that mankind cannot sustain indefinitely the current level of consumption and the inhabitants of the rich countries must reduce the present level of physical and energy consumption.

Given these realities, *Roegen* conceptualized some elements to be included in a minimal bio program, able to ensure a balanced standard of living for humanity and on long-term, the program is structured in eight main ideas.

(i) Not just the war itself, but also the production of the instruments of war should be banned completely.

(ii) By using redundant productive forces as a result of giving up the weapons policy, through well-planned and honest measures, the underdeveloped countries must be helped to reach in the shortest possible time an adequate standard of living, which would lead to the termination of the current state the reprehensible things characterized by a polarization of wealth of the planet[15].

(iii) Mankind should aim to gradually decrease the population.

(iv) Avoid any waste of energy and matter.

(v) We need to 'heal our infinite desire for extravagant gifts and gigantic splendor'[16].

(vi) We must 'break free from fashion as well'.

(vii) The goods must be designed so that it can be repaired.

(viii) Giving up the practice of ' the circular syndrome' [17].

These ideas should teach humanity how to create a sustainable better world. Thus instead of (or in addition) to give priority to solving the problems of knowledge, how it is now, scientists should be committed to help mankind (all of us) solve the huge and current global issues, such as changing climate, population growth, poverty, war, pollution of the seas, land and air, destruction of natural habitats, rapid species extinction, proliferation, tyranny and injustice.

Therefore, if the official economic theories are or become inaccurate and the error is allowed to persist, the consequences become tragic, reaching up to the destruction of the very civilization that gave them meaning in a given stage of evolution of biosphere. The acceptance of either economic theory cannot be reduced only to a matter of decision on the validity or non-validity of abstract theories but, that is a decision on its harmfulness or benefits in the case of formalization at a certain time in the evolution of our civilization.

15 Georgescu-Roegen, N. (1975), *Energy and Economic Myths*, in Southern Economic Journal 41, no. 3, January.

16 Georgescu-Roegen, N. (1975) – idem.

17 The syndrome of the circular razor. The contemporary man uses a device in the morning - disposable – in order to shave as soon as possible in order to speed up to the workshop where he manufactures a whole new razor and faster and so ad infinitum.

Also, the bioeconomic approach can be the foundation on which an economic theory oriented more on innovation can be designed, as well the basis for building concrete and realistic programs innovation-oriented for the civilization leap: to another global civilization, sustainable, based on knowledge.

In conclusion, we can say that the great problems facing humanity, problems that it has itself created from the unsustainability of global economic growth of the first Western-style civilization over the centuries of existence, and consequently the inadequate foundation of the economic science (theories of the mainstream) cannot, as Einstein said, '*... to be resolved at that same level of thinking with which we created them'*.

In this context, there is an urgent and profound need, both from intellectual and humanitarian reasons, to make a revolution (paradigm) in science and the scientific thinking as well.

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