AND MAYBE GEORGESCU-ROEGEN WAS RIGHT

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Abstract

Georgescu-Roegen's name is tied to Bioeconomics. He is the founder of the discipline and he is the one who engendered the Bioeconomic program. This eight step minimal program has started many controversies over time. Our aim is to argue that Roegen's recommendations are utopian only if treated separately from the whole. Studying them in context might give us the answer we need to solve the deep human crisis, which translated into a financial and economic drama, and define a new normality.

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1. Introduction

One cannot talk about sustainable development without referring to the work of Georgescu-Roegen and mainly to his book *The Entropy Law and the Economic Process*. At the same time, stating that this is the main subject would disarray his thinking from one important part, the critique brought to the neoclassical paradigm. In our opinion the only view that could bring us closer to the understanding of this great mind, is the one that does not separate the two subjects. Covering only the analysis of "standard" economics won't tell us why our science urges for a change. At the same time focusing only on the minimal Bioeconomic program proposed by his theory and analysing it with the same old instruments in the context of the traditional array of thinking would make us fail to see the bigger picture.

Before exposing the "moments" of this paper, we find ourselves compelled to mention that our aim is to merely sketch a framework of what it should be an analysis of Georgescu-Roegen's work and hopefully raise some doubts regarding the current array of thinking.

In the first part of the paper we will briefly describe the connection between entropy and economics as it was established by the author and present the eight steps of the minimal Bioeconomic program.

The second part is dedicated to the examination of the main changes proposed by the roegenian paradigm.

In the third part of this paper we try to reinterpret the Bioeconomic program and give its rightful place in the context of Roegen's work as a whole.

2. Entropy and economics

The free thermal energy of a closed system continuously and irrevocably degrades into bounded energy. Extending the properties of thermal energy over all the other forms of energy concerns the second principle of thermodynamics, the entropy law. This law states that entropy (i.e. the amount of bounded energy) of a closed system constantly increases and that the order of such a system is continuously transformed into disarray. Striking here is the example used by Nicholas Georgescu-Roegen of the piece of coal, combustion converts into heat, which can be used to create mechanical work before it disperses into the system, and ash, a waste; but what is more important, after burning one cannot recreate the original piece of coal.

The free energy which people can access is found in two distinct forms. The first one is a stock, the stock of free energy from underground mineral deposits and the second is a flow, the flow of solar radiation captured by the Earth. Living organisms require low entropy resources to combat their entropic degradation. But while all species depend on the sun to access this low entropy, man learned to use other sources of low entropy, such as fossil fuels and minerals.

All activities and overall economic processes are inevitably entropic processes. In other words, in terms of thermodynamics, what goes into the process consists in economically valuable natural resources, and what comes out are worthless wastes; the matter-energy is absorbed in the economic process in a low entropy state, and that which is eliminated in a state of high entropy.

But sources are finite, less the solar radiation flux, which is likely to provide low entropy long after the human race will be extinct, but which we cannot harness widely, properly yet. *"The rush for low entropy"* has characterized the entire existence of mankind. Millions of years were required to move from hunting to agriculture, thousands of years to

move from a predominantly agricultural environment to a largely industrial one. At some time, the environmental entropy increases so much that is required a shift towards other energy sources. Affordable energy sources are used first. Each successor environments sustain themselves with a form of energy less accessible than its predecessor.

As appears from the above, entropic degradation of the environment occurs faster in the presence of life than in its absence. But of all species, man alone has developed exosomatic organs, although they conferred advantages over other species, they have created a certain dependency on them and the comfort offered by them. He consumes more and more low entropy, neglecting the increased danger as the planet becomes unfit for human species survival. The only way to protect future generations against the current loss of energy is our own reeducation - *in the sense of a responsibility based on care and love towards man - our future associate. Love for your own specie is the key for solving the crisis of tomorrow*, writes prophetically Nicholas Georgescu-Roegen. The monopoly over the future of the present generation will be substantially reduced in an economy based primarily on solar flux. Such an economy, rightly called Bioeconomics, in the vision of Nicholas Georgescu-Roegen, can be applied according to the following minimal program:

1. An almost total decrease of arms production, which is a considerable loss of matter and energy.
2. In this way enormous productive forces will be obtained, by means of which industrialized countries could help developing countries to achieve a better standard of living.
3. Gradual reduction of the world population to a level where it could be fed from an organic rather than mechanized agriculture. This task falls mainly on the shoulders of the developing countries (the case of Romania)
4. Avoid any loss of energy and matter, such as excessive heating or cooling and speeding on vehicles with internal combustion engines, if necessary even by introducing appropriate legislation. Nuclear power can not yet fully be considered a controlled man-power.
5. Liberation of unhealthy human current trends to produce and consume new products of all kinds, and mechanical inventions "fashionable" and sophisticated goods (buying a new car every year, should be considered a bio crime).
6. Humankind should get rid of fashion. Getting rid of perfectly good objects only because they are out of fashion should be considered a crime.
7. Companies producing goods should focus on sustainable products, on facilitating services, especially their maintenance and repair.
8. We should cure ourselves of the "circumdrome of the shaving machine", which is to shave oneself faster so as to have more time to work on a machine that shaves even faster, and so on.

3. A new vision of the economic world: Roegeconomics

To get a better understanding of the significance of Roegen contributions to the development of economic science and to understand the actuality of this theme, it should be noted that in the current economic crisis, many voices were raised to criticize economics. The main complaints that are brought are excessive use of mathematical instruments, physics envy, allegation which relates precisely to the attempt made by "standard" economics, especially the neoclassical paradigm, to create a structure similar to that of Newtonian physics, the presumption of rationality of economic actors. Nicholas Georgescu-Roegen attacks these issues, but does not belong to the category of those who only report problems; he gets in their mechanism emphasizing both their source and how should economic reality be reflected in order to prevent their repetition.

3.1. Economic reality in the assembly

While neoclassicism followers tried to turn economics into a logical-mathematical science, Nicholas Georgescu-Roegen remains convinced that it is a social science finding that Marshall's definition of *"study of mankind in the ordinary activities of life"* [1, p. 336], is closest to the truth. With man and human activity in its focus, economics raises some difficulties to those who try to delineate its borders. Roegen is convinced that cropping the economic process and studying it as a slice of reality is not only impossible, but also counterproductive. The borders of economic science are dialectical penumbras; economic reality is interwoven with the political reality, social and even biological. For this reason, the study of economic activity should consider these dimensions when formulating the assumptions, and when interpreting the results. Economic analysis taken out of the context of the entire assembly has only the value of an intellectual exercise, failing to meet the problems posed by economic reality.

Economic evolution influences the evolution of social, cultural and biological life. But the process is not a bi-univocal; it is in its turn influenced by them. In order to have a complete and true image on human behavior in economic activity we must take into account all these facets, which are dimensions of the same reality. Therefore economy appears to us as a living organism, and knowing it involves multiple knowledge.

The need to incorporate all these elements makes the object of economics, to be impossible to be entirely integrated in a mathematical model. Mathematical analysis remains a useful tool for economic science, as well as for other sciences, but only that. To capture the complexity of economic life qualitative analysis is indispensable.

3.2. Validation in economics

Given the *social and practical nature* of economic science, in agreement with his contemporaries Mises and Hayek, Roegen considers as a criteria of truth for the human action the *factual reality*. Just because theories built with Aristotelian logic do not contradict one another and the reasoning is built correctly, it does not mean that there are true. Validation criteria send to reality, and these sentences can be considered only as analytical tools.

The impressive theoretical edifice created by the marginalists mathematicians lacks the liveliness given by human action. To this inert economic reality Roegen opposes a social science, where „introspection *can provide [...] support to give the dose of rationally and objectiveness to the used methodology"* [3, p. 4, emphasis added]. Most times, in social sciences, to establish the truth, is more useful the direct dialogue with the studied object than neutral experience.

In order, to conclude, we will quote Georgescu-Roegen that wrote, to emphasize the advantage offered by the social sciences, that the economic researcher *"can translate into action or resort to introspection, and, above all, can find the reasons of the one he studies by asking him questions. If, per absurdum, a physicist could talk to electrons, would refuse to ask it: why skip? Certainly not."* [1, p. 381]

3.3. The importance of the cultural matrix in economics

An important point of critique made by Roegen to "standard" economics is related to the *institutional uniformity*. The world of the neoclassical economic theory is composed of townspeople. Economic analysis has had as a starting point the Western developed society, and development models created cannot be applied to underdeveloped economies. Georgescu-Roegen shows in this context that the theory of marginal utility, as described by neoclassical economics, cannot explain the village economy if ignores *its cultural matrix*. Building its criticism thinking about the Romanian peasant, Georgescu-Roegen denies his *indolence* and *inertia* described by the neoclassical theory and argues that *urban civilization has found a serious support at the start point in the diligence, the modesty and the moderation of the peasant*. The reluctance of peasants to the values and ideas that were delivered from the city came after a long period in which he was humiliated and impoverished or assimilated and perverted.

Unlike insects with social life, man is not born with an endosomatic code that would guide his practices within the group. In order to guide within the social activities, man had to create a code. The result is tradition. Therefore *"man is born* with *an endosomatic code (biological), but* within *an exosomatic code (social)"* [1, p. 376, emphasis added]. Just as a biological process makes that all the genes to be transmitted from one generation to another, *tradition* hands down through generations the *institutions* which have been shown useful for the community. Each tradition has an *inner logic*. This therefore leads to the impossibility of creating a viable cultural matrix by arbitrary choosing the matrix elements.

To argue the importance of the cultural matrix in economics, we turn our attention towards the Buddhist society. Here, because of the mentality printed by the teachings of Buddha, the general laws of classical theory, *a greater gain is preferred to less* and *the individual is inclined to obtain the greatest amount of wealth with as little labor and lower abandonment*, do not apply. Therefore, for "standard" economics the behavior of these individuals is "irrational".

Tradition imposes certain inertia to society; therefore we cannot make individuals belonging to other cultural matrices to behave "rationally". The economic development must take into account the spirit of the society to which it applies. To succeed in this endeavor, we must appeal to the empathy of the researcher. Although not as accurate as a microscope, man can record phenomena that no physical instrument can see.

3.4. The economic value in Roegen's view

"The overarching goal of economic activity is self-preservation of the human species" [1, p. 270], and of all human needs only the purely biological ones are essential for survival. It follows that a prerequisite for self-preservation is the biological need and how those needs require access to low entropy resources; we can deduce an initial condition for something to be useful. But utility is not the source of value. This source is identified by Roegen also in thermodynamics. *"The land, for example, although it cannot be used, has economic value for two reasons: first, is the only net that can catch the most vital form of low entropy, secondly, the size of the nets are immutable. Other things are rare in a sense that does not apply to land because, first, the amount of low entropy from the environment (at least) decreases continuously and irrevocably and, secondly, a certain amount of low entropy may only be used once."* [1, p. 270-271]. According to Roegen all goods consumed by humans in order to feed the *"enjoyment of life"* are valuable, whether they are produced or collected from nature, with the sole condition that they contain low entropy.

Although low entropy is a necessary condition for utility, it is not sufficient, as the utility is necessary but not sufficient for economic value. The sources of value can be found in rarity and low entropy. But any production of goods with low entropy consumes other lower entropy items. Therefore, according to the second principle of thermodynamics, all human activities result in a deficit of energy, and hence inevitably the production activity and economic growth are entropic processes. Technological developments create temporary areas of order, of low entropy, but with the price of increasing the work effort necessary to obtain a unit of product, precipitating the entropic process and disorganization in the universe. Therefore the entropy of the ambiance is steadily increasing and free energy available is becoming gradually rarer, so it becomes more costly to generate low entropy. As technologies become more complex and their energy needs increase, the law of diminishing returns comes into action.

At the same time, as a good passes through several successive stages of processing from the natural raw material stage to the finished product, the more energy is used and the total entropy of the system increases.

From the lines above we can conclude that the value of goods is even greater as their own entropy is lower and thus the overall entropy of the economy, society and the system is higher. On the same note, the value of goods is even lower, as their own entropy is higher and the entropy of the system remains low. These circumstances make the value of the goods to correspond simultaneously to lower entropy of their own and higher overall entropy. The evolution of society, with the multiplication and diversification of human needs, in conjunction with increased resource scarcity, increases exponentially high the weight of manufactured goods that come from productive processes increasingly devious and long, whose value witnesses a historical growth trend. Value is therefore an expression and a measure of a doubling; being in the same time the measure of its own entropy and it's opposite the entropy of the system.

In turn, prices also undergo duplication. They are high for high value goods, both because they capture the costs of the considerable amounts of energy used to decrease the entropy of the finished product and because they express the entropy increase in the overall system. With the increasing value of goods, increases the overall entropy of the system, and therefore prices show a general historical growth trend.

On the same basis of entropy Nicholas Georgescu-Roegen explains the emergence and accentuation of inflationary processes. Attraction of matter and energy in the circuit is becoming increasingly expensive as the depletion of easily accessible reserves and the switch to others increasingly difficult to operate, so that *"the increasing costs of non-renewable energy are at the core of the inflation spiral. Finally we can say that inflation is a measure of the state of entropy of the environment."* [2, p. 110]

4. Conclusions

If we take into account at every step of the analysis the fact that each social science should have at its core the intent to improve the existence of the individual and the concept "enjoyment of life" we discover a theory more similar to the new ecolonomics and to the older Buddhist philosophy than to ecological economics or bioeconomics of today. Although they claim Georgescu-Roegen as a founder, in their struggle to be recognized, the later two took a path that the only similarity that one can found between then and roegeconomics is the concern for the resource scarcity.

This new theory puts the individual at its core, an individual that has a social, biological and spiritual life among the economical one. The "enjoyment of life" sends the human being to find its fulfilment in what he is and not in what he has. The centuries in which economists everywhere tried to find the factors of economic growth taught humankind that the rush for wealth is more important. Now is time to teach ourselves and others that in fact all that matters is finding our place in the world. The Chinese learn, while being in school, the teachings of Confucius to become responsible adults and then Taoism to discover again the world through the eyes of a child. The only way we can achieve sustainable development is by understanding that we all have the same rights, we have to respect ourselves and everyone else, translate all those mentioned above to institutional level and then sit back and enjoy our lives.

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