

Recursive Process in Decentralized Economic System: Interdisciplinary Analysis

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Abstract

As a result of dialectical analysis of economic processes the market economy is represented as a complex, non-linear, functionally closed, and causally open system. Such systems have a number of unique properties that have been well studied in chaos theory, constructivism and second-order cybernetics. In the present article, based on an interdisciplinary analysis of market economy in the discourse of constructivism and second-order cybernetics is given a fundamentally new approach to the analysis of general economic equilibrium and economic cycles. The article proposes a "symmetrical model" of economic equilibrium, which is the attractor of decentralized economy as a complex system of economic actions in which self-organization and autopoiesis are carried out thanks to recursive processes.

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Introduction

Economics faces serious challenges. The realization that the neoclassical theory does not adequately reflect the reality began long ago. But the global crisis of 2008 finally convinced many economists that economics itself is in the deep crisis. If in the 30s of the last century, J. Keynes, J. Robinson and several other economists "blamed" the neoclassical theory for provoking the "Great Depression", today many economists all over the world recognize the huge role of neoclassical theory in the emergence of the crisis of 2008. Respectively, more and more economists around the world are convinced of the necessity of a radical rethinking of neoclassical paradigm.

Economic knowledge is acquired through cognition of economic reality. This knowledge has an influence on economic policy, education, worldview of politicians, experts and economic subjects. All this stipulate economic decisions and actions of the subjects. But totality of these actions just forms that economic reality, which is studied by economics. Therefore, collective actions depend on the knowledge and knowledge depends on collective actions. That is, arises a circular causality - the object of knowledge depends on the results of knowledge. Since neoclassical theory is unaware of this circular causality, in this theory, it takes the form of a logical "vicious circle". Thus, it cannot provide an adequate economic theory and develop effective policies.

The mentioned "vicious circle" is caused by the false methodology of neoclassical theory. According to this methodology, the neoclassical theory studies only economic phenomena, that is, the surface of economic reality, but does not study the essence of these phenomena, because it does not recognize its existence and does not own the methods of its investigation. But what happens in the economic reality at the level of empirical facts, to a large extent is caused by it itself.

But on the actions of economic agents depend only the processes occurring at the empirical level that is something which is studied by neoclassical theory. On these actions do not depend the essence of a market economy. Rather, they themselves are caused by this essence. Therefore it is necessary to examine the essence of economic processes. But to explore the essence is possible only by dialectical method of research that significantly differs from the methods of neoclassical research.

As a result of investigation of the essence, the market economy appears as a functionally closed complex nonlinear system. Like all such systems, it has a number of unique properties, which are studied by second-order cybernetics, constructivism and chaos theory. The study of these properties allows us to give answers to many questions, to create effective mathematical models and to develop adequate economic policy.

1. Interdisciplinary context

1. To exit from the crisis economics must take greater account of the achievements of other sciences and implement interdisciplinary research. In this regard, scientific ideas arising within constructivism deserve special attention. As an independent branch of the philosophy of science constructivism emerged in the 80s, and soon attracted the attention of scientists. Constructivism is gradually gaining more and more influence in contemporary epistemology. However, the problems of constructivism go far beyond epistemology. It is amazing but constructivism is built into the inner core of cybernetic theoretical concepts. Cybernetics creates constructivism as its logical continuation. From the very beginning of its existence, from the 1940-1950-s (the concept of N. Wiener, U. Ross Ashby, X. von Foerster), one of its central concepts was the idea of circular causality.

2. A good example of circular causality can serve the aforementioned dependence of cognition of economic reality on the results of this cognition. On the basis of his knowledge the actor interacts with reality, adapts to it, and adapts the reality to himself. Actor and reality do change each other during the interaction. After all, as a result of observing the actor receives the knowledge about reality. And it is clear that the actions of the actor cannot be the same before and after the acquisition of new knowledge about the existing reality, because along with their change the nature of these actions also changes. And so it is clear, that the results of observations, i.e. the knowledge, cannot remain unchanged before and after the interaction acts with reality, because the observable reality changes as a result of these interaction acts. There is a circular causality. Here, the effect caused by some reason, itself becomes the reason causing the effect. Cause and effect are merged into one. This is an activity that has become the cause of itself, or self-generation activities. Formally, this process can be expressed in general form as:

$$x = F(x),$$

where x - is the interaction between any elements of a system, and F - is the form of the relationship between these processes. Systems, in which such circular processes are carried out, are called self-referential systems which are studied by second-order cybernetics and constructivism. Such systems are autonomous, operationally closed and have unique properties. An interesting feature of these systems is that they have so-called "Eigen-Values", "Eigen-Functions", "Eigen-Algorithms", "Eigen-Behaviors". The fact is that in the processes of interaction with the environment there is no unequivocal correspondence between input and output. The reaction of such a system to the impacts of environment depends not only on the nature of this impact, but also on the state of system, which in turn is caused by the previous state and previous impacts of environment. And the output reaction affects its subsequent change. The system evolves and gets its history. In other words, the output is not a direct response to the input stimulus. It depends on the intrinsic structure of the system, its current state and those recursive processes that were initiated by the input signal. Such behavior of system assumes the character of "Eigen-Behaviors" and it cannot be considered as a simple response to external stimuli in the direct sense of the word.

Constructivism has a strong influence on sociology. The German scholar Niklas Luhmann (1927-1998) was one of the first who built a system of social philosophy on the fundamental ideas of constructivism, such as the ideas of theory of complex self-organizing systems, autopoiesis, operational closure and causal openness, self-reference, structural coupling, contingency, etc. Proceedings of N. Luhmann represent a sociological version of constructivism and are mentioned already as classic works on a par with the works of E. Glasersfeld, H. von Foerster, W. Maturana, F. Varela, and other famous constructionists. In contrast to sociologists, due to the dogmatism prevailing in modern economics, economists have shown indifference toward new ideas of the constructivists.

3. As a result of dialectical analysis of economic phenomena and processes, the market economy appears as a functionally closed complex system, which has all the properties that are well studied in the second-order cybernetics, and about which constructivists write. Out of the separate actions of million independent economic subjects, who act in their own selfish interests, depending on the actions performed by these functions the various economic flows are formed. These flows in the scale of society form the functional structure of a closed complex nonlinear system - a market economy. The market economy is a complex self-organized autopoiesis system, the primary element of which is economic action.

The structural functional analysis of this system leads to a fundamentally new understanding of how occurs the self-regulation of decentralized economy, how arise the economic cycles. This method of analysis has long been successfully used in sociology, but, unfortunately, in economic theory it is not given due

attention. Thanks to the work of sociologists Talcott Parsons and Robert Merton structural functionalism reached the greatest influence in the 1950-1960's, but the second half of the 1960s more and more intensified criticism of this approach from different perspectives. After a long decline of interest in the theory of Parsons, with the 80s the interest in functionalism was renewed. The most prominent representatives of "neo-functionalism" are sociologists N. Luhmann, J. Alexander and R. Munch. Especially should be emphasized the role of N. Luhmann, whose name is associated with fundamental rethinking of basic concepts of functionalism of the latest advances in the theory of complex systems and methodology of constructivism.

Scientific concepts of sociologists attempting to explain social phenomena from the perspective of the theory of complex systems are developed in detail, have a long history and intensive research in this direction continues. Similar attempts to explore the society in the context of the theory of complex systems, are undertaken in the framework of synergetics, as a scientific paradigm. However, the difference between these two approaches is that in its methodology synergetics based on the positivism, but constructivists are more inclined to transcendental phenomenology and therefore fully take into account the specifics of society not only as a living system, but also as a cogitative, policontextual, semantic system.²

Structural functionalism sees society or other social objects as a system, as a structurally dissected integrity, in which each system unit performs a specific function, creating conditions for the normal functioning of all subsystems and of the system as a whole. The main problem that sociologists try to explain on the basis of functionalism - How does the social order under arrear conditions of free activity of individuals, pursuing their own interests? How does a social mechanism operate that leads to mutual coordination of their actions in the public interest? As we see, sociologists of this direction see for themselves the basic scientific problem the same as, beginning from Adam Smith, economists see it in relation to the decentralized economic system. Economic theory can discover for itself many valuable ideas in very interesting scientific developments of sociologists.

The functioning of society is the cumulative result of interactions of an infinite set of individuals. To understand the society as a system, it is necessary in this chaos of interactions and absolute social mobility of subjects in the social space and time to reveal something relatively sustained and stable, i.e. structure. In the structural-functional paradigm structure of a system of social actions is understood as a set of relatively stable relationships between the elements thanks to which the system maintains its integrity and functionality in a transformation process under influence of external or internal factors. There is no structure outside the system and there is no system without the structure. They imply each other. Concrete individuals are born and die, begin and end socially active life, replace each other, but the social structures

² There is a close connection between constructivism and synergetics. Like synergetics, constructivism is the result of a generalization of a number of scientific concepts and researches in various areas of knowledge. It is interesting that many of these concepts belong to both discourses. Therefore, along with the names of the founders of synergetics - I. Prigozhin, H. Haken, E. Lorentz, B. Mandelbrot, etc., more often are called the names of H. von Foerster, U. Maturana, F. Varela and others, who laid the foundations of constructivism. However, between synergetics and constructivism there are also differences. Although, in general, they have a common methodological and philosophical installation, but in constructivism relatively more attention is paid to the epistemology and functioning of living systems, but in the spotlight of synergetics is the ontological context of studies, while the processes of learning and life processes are considered only as applied aspects of the functioning of nonequilibrium systems. In synergetics it comes about open nonequilibrium systems in general, but radical constructivism focuses on the process of maintaining homeostasis in living cognitive systems. In the conception of constructivism the self-organization of complex systems is based on the principle of feedback, which gives them stability. In synergetics this principle is of secondary importance, since the focus is on the dynamics of the system, balancing on the verge of chaos and order.

remain. That is, structures are not strictly tied to the actions of certain individuals. Accordingly, social systems are not composed of people. These are the people, who are involved in them, and performing certain functions by their actions support their existence.

4. In this concept, we adhere to the standpoint of Talcott Parsons, according to which the constitutive element of society, as a social system, is social action, and society is a system of social actions.³ At that, the economy is a kind of social system and economic action – a kind of social action. The term "social action" T. Parsons borrowed from sociological theory of Max Weber, according to which social action is a unit of social reality, its primary constituent element. Social action is an action because for actors it has subjective meaning, and is social because according to this sense it relates to the actions of others and is focused on them. (See, Weber, 1990) Through their actions all subjects are interconnected into a single system. Each action of the subject affects the actions of other subjects and the system as a whole. Each action has as a reaction another action. The action is a function of the expected reaction, and the reaction is a function of action, which caused it.

If we consider, for example, only economic subsystem, all actors, whether individuals, businesses, organizations, households, churches, universities, government agencies, etc. - all of them, in one way or another, participate in the economic process, perform in it a particular function. But none of these subjects is purely economic subject and in one way or another, each of them is involved in the functioning of other, non-economic subsystems. That is, all subjects are multifunctional. So naturally, unit or indivisible part of economical subsystem cannot be a holistic subject that performs not only economic roles, but who is also an actor of other subsystems of society. Economic subsystem does not cover all the actions of concrete subjects, whether individuals or groups, but their actions only in the specific role performing economic functions. The element of economic subsystem may be only those actions of subject, which perform some or other economic functions, i.e. only economic action. Therefore, as a subsystem of society, the economy is a system of economic **actions**, but not a system consisting of **subjects**. Weber defines economics as "autocephalous system of economic action."

5. An elementary action "... is the "smallest" unit of an action system which still makes sense as a part of a concrete system of action." (Parsons, 1949, 731). Elementary action (unit act) is the ultimate unity only in a system of actions, but by itself it does not constitute an indecomposable entity. It itself is composed of components, such as the end, conditions, means of one or more norms governing the choice of means to achieve the end. (See *ibid.*) To describe the actions requires an appropriate frame of reference, which is essentially a framework of relations between the elements of action. Without such a framework to talk about the action does not make sense. "... the schema is inherently subjective, This is most clearly indicated by the fact that the normative elements can be conceived of as "existing" only in the mind of the actor. They can become accessible to an observer in any other form only through realization, which precludes any analysis of their causal relation to action." (*Ibid*, 733) T. Parsons writes:

"Every physical phenomenon must involve processes in time, which happen to particles which can be located in space. It is impossible to talk about physical processes in any other terms, at least so long as the conceptual scheme of the classical physics is employed. Similarly, it is impossible even to talk

³ K. Marx believed that society is a set of public (social) relations; T. Parsons believes that it is a system of social actions; N. Luhmann believes that it is a system of communication. But, anyway, despite the various arguments, along with many other social scientists, they agree that the primary element of society (in the special sociological sense) is not an individual. Individuals form a society with their relationships, actions or communications, but they are not directly the primary element by which society is constituted.

about action in terms that do not involve a means-end relationship with all the implications just discussed. ... Thus the action frame of reference may be said to have what many, following Husserl, have called a "phenomenological" status. ... It is not a phenomenon in the empirical sense. It is the indispensable logical framework in which we describe and think about the phenomena of action." (Ibid, 733)

As we see it is important to distinguish between the actions themselves and empirical processes. In this context remark by Ludwig von Mises is also interesting:

"Economics is not about things and tangible material objects; it is about men, their meanings and actions. Goods, commodities, and wealth and all the other notions of conduct are not elements of nature; they are elements of human meaning and conduct. He who wants to deal with them must not look at the external world; he must search for them in the meaning of acting men." (Mises, 1996, p.92) Also: "Production is not something physical, material, and external; it is a spiritual and intellectual phenomenon." (Ibid, p.141)

6. According to the structural-functional approach the economy appears as a system of economic actions. But, according to the said above, the economic action is not purely empirical process. Economic actions are such only because of the meanings and values, which a man gives them. Therefore, the economy as a system of economic actions, exists only in human consciousness, and is a system of senses and values. But the empirical processes that correspond to the economic actions in the real world, by themselves are not economic actions, but only the causal processes that take place according to the laws of nature.

After all, the facts themselves are not economic facts. All depends on the ends, needs, which provoked them, depends on the relation of the subject to the existing and the due. Consequently, the subjects perceive in different ways one and the same objective facts. For example, production or consumption, as such, do not exist objectively. Objectively, exist only transformations of one objects into other according to the laws of nature. But whether or not a man would call it production or consumption - it depends on his attitude to this process. Accordingly, he will be called producer or consumer. Also on this depends whether or not he perceives these or other objects as products or resources, and whether or not perceives them as the embodiment of costs or utilities. Etc. etc. In the same way all other economic categories - they are relative and exist only in human consciousness.

Although by his economic actions a person on his owns will provoke some empirical processes, however, these processes exist as the real facts. But his attitude to these processes, which causes this or that perception of the facts, exists only in his consciousness and constantly changes together with his needs and ends. That is why, the same fact is perceived differently by different persons and even by the same person, depending on his needs and the ends. One and the same object or process performs different functions at the same time, simultaneously exists in different ratios to different subjects and objects, therefore, simultaneously is, for example, product, and resource, or buying and selling, import and export, credit and debt, and so on. In this (and only in this) sense, we can say that economic processes exist only in human consciousness. Economy is just his attitude to these processes through the prism of his needs, his understanding of due. And in it there is no mysticism. That is to be a producer, consumer, product, resource, etc. - all this is not inseparable real properties of objects or subjects, but those functions that they perform. It is impossible to produce a product, not being a consumer of resources. Therefore, he also is a consumer. But he is not only producer and consumer. He is also the seller and the buyer, investor and saver, creditor and debtor, etc. And in the conditions of division of labor, each of these functions he can perform only as one party, in collaboration with other economic actors. So in a market economy, he can be producer

only because someone else is a consumer; can be a seller - because someone else is buyer; lender - because someone else is debtor; etc. (See. Leishvily, 2013)

By its result every action excites the need for response to it in some way. For the result of every action is a means for the other actions, the product is a resource for other actions. The product of each action creates the need, according to which it itself becomes a resource, i.e. creates the need for another action in which this product itself will be consumed. Moreover, if the product cannot be transformed into a resource, it will not be considered as a product. From the very beginning the product is produced as a resource for future action. Therefore, each action in itself already implies a need for another action. And if it cannot find its continuation, it itself will appear invalid, fictitious. (See, Leishvily, 2012; 2012a. Leishvily 2011).

The various functions performed by the subjects and objects are interrelated, are constantly changing, transforming into each other, appear and disappear. (Below will be given the "symmetrical model", which shows the general logic of these transformations.) These are the invisible "threads" that bind all economic phenomena, processes, objects and subjects together to form the integrity, which we call the economy. At that, to ensure integrity of economy does not matter who, or what exactly performs this or that function. The main thing is that all the functions that are necessary for normal functioning of the economic system would be performed and, at that, would be performed in an appropriate proportion to each other.⁴

7. Actions differ from each other by their function. The function can exist in reality only being implemented, and therefore, only with the action. In reality, the function does not exist separately from the action, which it performs as well as the action cannot exist without performing this or that function. There is no action without the particular function; if the action belongs to the system, it performs defined function. Therefore, each economic action not only creates other action like itself, but creates "its other" action. This "its other" action, being the same economic action, is identical with it. Since otherwise it will not belong to this system, but it would be something belonging to the environment. And at the same time, "its other" action differs from its parent action by its function. It performs the function conjugate with it, which necessarily is implied by a function of parent action.

As already noted, in a market economy, the action, having a function of producing some good (using the consumption of some other goods) means "its other" action, which has the function of consumption of produced good. But since the action for production of good, and "its other" action for consumption of this good, performed by different actors, so before being consumed, produced good must be sold by producer, and therefore bought by consumer; and thus supplied on the market by producer; hence, the consumer should demand for this product before he buys and consumes it; then he must supply money for sale or other good; therefore, he acts not only as consumer, but also as producer, which also must give rise to a similar sequence of economic actions, as well as producer of goods consumed by him, etc. That is appears a

⁴ The conclusions derived from the analysis of "symmetric model", and the whole structural and functional analysis of the economic system are conformable to many ideas of French structuralists. As a scientific discipline in humanities structuralism was born in the 20s. of XX century in linguistics, and then spread to many areas of knowledge. In a narrower sense, structuralism implies a complex of scientific and philosophical ideas associated with application of the structural method and is most popular in the 60s. in France. Representatives of structuralism (Levi-Strauss, Foucault, Derrida, Althusser, and a number of other scientists) concluded that the concept of structure is characterized not only and not so much of a stable ratio of elements, but a set of rules under which, by rearranging the elements and certain symmetric transformations from one object can be received the second, third, etc. To get single structural regularities of a set of objects, is necessary to describe their differences as converted into each other specific embodiments of a single abstract invariant. At that, attention should be accentuated not on the natural properties of investigated objects, but on the relationships between the elements and on depending on these relationships systemically gained properties. Structuralists call this principle - "methodological primacy of **relations** over the **elements** in the structure."

sequence of actions, whose functions are interrelated. At that the circular organization of interrelated functions is formed.

8. In the end, we find that all the functions performed by different actors, are interrelated as well, as the actions, which perform these functions. All of them generate each other. Each action creates "its other" action and itself is generated by others, because itself is "its other for its other." Through this they reproduce the structure of system. A functionally closed structure of a system or functional closeness, that is a circular organization of intersystem functions, is reproduced by the sequence of performed actions; for reproduction of this sequence of actions is caused just by the very functions, which are performed by each of these actions. The sequence of actions causes the reproduction of circular organization of functions. Their circular organization determines this sequence of actions, thanks to that each action generates "its other" action, just that other action, which is a necessary link in this sequence, which reproduces the circular organization of functions.

In this functional closeness of structure is just reflected the essence of economic subsystem of society based on a division of labor; because these functions only show the relationships between themselves. They are closely interrelated and refer to each other as positive and negative: consumption and production, selling and buying, supply and demand, investment and consumption in debt, credit and debt, making profits and making savings, entrepreneurship function and saving function, etc. Opposites can come into clash only because they are in relation and form a unit, in which one moment is needed as well as another. These functions cannot exist without each other. They make a single whole, closed structure, where everything is relative, where all relate to each other as positive and negative, where one cannot exist without the other. The "symmetric model", considered below, which reflects the functional closeness of economic system, reflects the **essential relationship** of a market economy and, thus, reflects in itself the **essence** of economic system in which everything is relative and all are in reflective relationships to one other.⁵

2. The "symmetric model" of general economic equilibrium

2.1. Preliminary concepts⁶

1. According to this model it is supposed that primary resources are not production factors, but their services. Respectively, on the market of primary resources, as the goods, entrepreneurs buy from owners not production factors, but their services, more precisely, the rights of temporal use of these services, or time, during which the entrepreneurs can use these services. The price of these rights of temporal use of

⁵ "In the sphere of Essence one category does not pass into another, but refers to another merely. In Being, the form of reference is purely due to our reflection on what takes place: but it is the special and proper characteristic of Essence. In the sphere of Being, when somewhat becomes another, the somewhat has vanished. Not so in Essence: here there is no real other, but only diversity, reference of the one to *its* other. The transition of Essence is therefore at the same time no transition: for in the passage of different into different, the different does not vanish: the different terms remain in their relation. When we speak of Being and Nought, Being is independent, so is Nought. The case is otherwise with the Positive and the Negative. No doubt these possess the characteristic of Being and Nought. But the Positive by itself has no sense; it is wholly in reference to the negative. And it is the same with the negative. In the sphere of Being the reference of one term to another is only implicit; in Essence on the contrary it is explicit. And this in general is the distinction between the forms of Being and Essence: in Being everything is immediate, in Essence everything is relative." (Hegel, 1974, 262-263.)

⁶ The details of these prerequisites argued in (Leishvily, 2012; 2012a; 2011; 1996).

services is the Wage, Interest and Rent.⁷ But a society buys from entrepreneurs the entrepreneurial services, paying for them in the form of profit in composition of prices of purchased goods.

2. The property right can't exist without a subject of law, without the legal owner. As primary resources are on sale in the form of property rights (the right of use of factors' services) reproduction of primary resources as the goods is reduced to reproduction of life of owners of production factors. But life of owners is reproduced as a result of consumption of final products. Thus, final products are produced from primary resources and primary resources, as commodities, are reproduced due to the consumption of final products by owners of these resources. Thus, it is supposed that production and consumption are the opposite moments of economic activity, i.e. are necessary addition for each other within the limits of a single whole and at the same time, are opposite to each other. Due to consumption of resources, products are produced and due to consumption of products - resources are reproduced. So, according to this model it turns out that in a broad sense, products and resources are relative concepts. For the products produced by producers serve as resources for consumers, but the resources consumed by producers are "the products" reproduced as a result of consumption of final products by consumers. But in a narrow sense, resources are that producers consume and products - that they produce.

3. For production of final products is necessary not only objective production factors (Labor, Land and Capital), but also the subjective factor - Entrepreneurship. The entrepreneur renders services to a society by taking on the entrepreneurial risk. The risk implies that he buys primary resources from a society (owners), without foreknowing, whether he can cover his spending by incomes from sale of produced products or not. By these resources he produces products and sells them back to a society at the price exceeding his costs. But to buy primary resources, he should be the owner or financial resources, or any other assets under the pledge of which he can take the credit. In either case he puts his property under the risk. For his services the entrepreneur demands from a society a payment in the form of profit, as premium over his expenses.

4. In a market economy not only producers face the risk of production and selling, and the risk of inefficient revenues. If produced production does not meet the needs of customers, decrease of demand for products will cause decrease of demand for production resources. Therefore, consumers (owners) also face the risk that because of structural shifts in economy or due to cyclic fluctuations demand for their resources can be reduced. Also their future incomes and well-being are under the risk. Consumers are induced to make saving and consequently they demand from entrepreneurs such payment for their resources, which will allow them to make saving.

5. The purpose of producer as an **entrepreneur** is not maximization of quantity of produced production, but maximization of profit. Also, as well as the consumer's purpose as an **owner** is not maximization of quantity of consumed goods, but satisfaction of needs at minimum costs, i.e. minimization of costs on consumption and maximization of saving, which remain after satisfaction of needs⁸. To have saving - itself is one of needs in a system of needs. And consumer solves himself - how to distribute the income between consumption and saving for maximum satisfaction of all system of needs.

6. As the price of entrepreneurial services the rate of profit, for the sake of which he runs risk of loss of these resources, is supposed. As the price of thrift the rate of saving, for the sake of which a saver abstains from consumption of a certain share of income, is accepted.

⁷ Still L. Walras in his model clearly distinguished production factors from their services. (See, Walras, 2000). To this difference isn't given proper attention in modern models, which complicates creation of adequate model.

⁸ I.e. it is meant that maximization of saving is carried out not at the expense of underconsumption, but at the expense of: 1) optimization of expenses on consumption, and 2) maximization of incomes from sale of resources.

7. It is supposed that depreciation charges are purely financial procedure, which has only remote relation to real loss of cost by the fixed assets. The choice of norms and methods of charge of amortization depends on state economic policy, but not on actual deterioration of real capital. So, according to the given model amortization is a part of profit, but not a part of the cost price of product (which is gradually included in final goods).⁹

8. All those goods production and consumption of which needs the larger time than time interval under review refer to the capital goods. To these goods is attributed the physical and human capital¹⁰. Production of both these capitals requires investments which on the other side is consumption on credit. Production of physical capital goods (both for production and consumption needs) is connected with investments of resources into production, which is consumption of resources on credit. But production of human capital is connected with investments of products into consumption, which on the other hand is consumption of products on credit.

9. As it is the closed system, the sum of entrepreneurial costs on resources and the gross profit received by them in all sectors equals to the sum of incomes from the sale of final products. On the other hand, the same sum is consumers' incomes (wage, interest, rent and profit) - owners of production factors¹¹. Also, entrepreneurs' incomes from sale of final products are consumers' expenses on purchase of final products.

10. This model of general equilibrium reflects the system of interrelations not between the subjects, but between the economic flows. Macroeconomic effects and a business cycle are presented not as the result of interaction of separate actors within the limits of existing institutes, but as the result of interaction of commodity and financial flows, generated by independent decisions of these actors and which are the aggregated results of their actions.

2.2. The general equilibrium model

1. This model reflects a system of interrelations not between economic agents, but between those economic flows, processes, functions that ensure the integrity of the economic system. There is considered a decentralized closed economic system in which are produced final products (m) through consumption of primary resources (n) and are reproduced primary resources (n) through consumption of final products (m). In order to simplify the model the intermediate products aren't considered.¹² Since both products and resources are the goods, the market economy is represented as a system in which takes place "production

⁹ Disputes were always in understanding of depreciation. There are two substantial characteristics of depreciation - 1) wear of assets and 2) formation of renovation fund. The allocation of the cost of assets to periods in which the assets are used (depreciation with the matching principle) doesn't correspond to real processes of wearing. To define adequacy of real wearing to the norms of depreciation is impossible. Besides, any norm of depreciation assumes possibility of using of object after its full normative wearing. Establishing the norm of depreciation government regulates the rates and character of reproduction in sectors. Therefore, it is supposed that depreciation is not a stretched write-off of expenses incurred before, but simply a part of profit, which isn't taxed and from which dividends aren't paid.

¹⁰ To investments into the human capital (consumption investments or consumption on credit) is concern consumption of entrepreneurs, consumption in the spheres of education, sciences, cultures, public health services etc., and also stocks of products at consumers (as insurance of the future consumption).

¹¹ The entrepreneurs simultaneously are producers and consumers, therefore, profit as a part of producers' incomes and as incomes of entrepreneurs as consumers - are equal.

¹² When taking into account the intermediate production model will take a more complicated form, although functionally closeness of system and the very essence of the processes do not change. (See, Appendix 2).

of goods by means [of consumption] of goods" (P. Sraffa). Division of goods into products and resources is conditional. Therefore, all goods are the products for their producers and resources - for their consumers. The sector 1 produces products that are resources for the sector 4. As a result of consumption of these resources, the sector 4 produces products that are resources for the sector 1. Exchange of goods happens in the markets (sectors 2 and 3). Some produce all products and others consume, some sell and others buy. Therefore, all agents are both producers and consumers, sellers and buyers. Each of them receives incomes and bears expenditures, and the difference between revenues and expenditures is used for investment in physical and human capital.

Generation of incomes and expenditures is based on the price. As the expenditures of buyers are incomes for sellers, we have the following. On the one hand prices reflect production costs and therefore are formed on the basis of the prices of goods consumed in production processes. On the other hand, the prices reflect the utility of goods. Since the utility is the ability to satisfy the solvent needs, the prices stipulate the amount of those expenditures that consumers sacrifices from their incomes for the purchase of this utility. That is, the price of the purchased goods for consumers is monetary expenditures caused by the purchase of one good. Therefore, in this model, the incomes and prices paid from these incomes have opposite signs. This reflects the fact that as a result of buying the prices of goods as "neutralize" incomes, as well as the utility "neutralizes" (satisfies) the need as a result of its consumption. The elements of diagonal of matrix simultaneously show production value of goods as well as their consumption value.

Since the elements of diagonal of matrix simultaneously are the elements of both rows and columns, they simultaneously reflect both costs and utility. Lines show the elements of the cost of production of goods, and the columns - the distribution and consumption of the same goods in the production processes of other goods. In the matrix the resources clockwise are transformed into products, which in turn are consumed as resources for the production of other products, etc. The money incomes are transformed counterclockwise into money expenditures, which in turn are themselves the incomes and then again are transformed into expenditures, etc.

Each element of the diagonal aligns the rows and columns of the matrix. Sum of elements in each row of the sector 1 is equal to the sum of elements of corresponding columns of sector 4, and the sum of elements in each row of the sector 4 is equal to the sum of elements of corresponding columns of sector 1. That is, in a closed economic system under equilibrium conditions, is produced only what is consumed and is consumed only what is produced. This correspondence between production and consumption means that for each commodity (products and resources), demand and supply, selling and buying fully correspond to each other.

Sector 1					Sector 2				
$-a_{11}x_1v_1$	$-a_{12}x_1v_2$	...	$-a_{1(n-1)}x_1v_{(n-1)}$	$-\alpha_1 A_1$					x_1p_1
$-a_{21}x_2v_1$	$-a_{22}x_2v_2$	...	$-a_{2(n-1)}x_2v_{(n-1)}$	$-\alpha_2 A_2$				x_2p_2	
...		
$-a_{(m-1)1}x_{(m-1)}v_1$	$-a_{(m-1)2}x_{(m-1)}v_2$	...	$-a_{(m-1)(n-1)}x_{(m-1)}v_{(n-1)}$	$-\alpha_{(m-1)} A_{(m-1)}$		$x_{(m-1)}p_{(m-1)}$			
$-a_{m1}x_mv_1$	$-a_{m2}x_mv_2$	...	$-a_{m(n-1)}x_mv_{(n-1)}$	$-\alpha_m A_m$ $-P'$	$x_m p_m$ $I = S$				
				$P = Q$ $Y_n v_n$	$-S'$ $-\beta_n B_n$	$-b_{n(m-1)}p_{(m-1)}y_n$	...	$-b_{n2}p_2 y_n$	$-b_{n1}p_1 y_n$
			$y_{(n-1)}v_{(n-1)}$		$-\beta_{(n-1)}B_{(n-1)}$	$-b_{(n-1)(m-1)}y_{(n-1)}p_{(m-1)}$	...	$-b_{(n-1)2}y_{(n-1)}p_2$	$-b_{(n-1)1}y_{(n-1)}p_1$
	
	y_2v_2				$-\beta_2 B_2$	$-b_{2(m-1)}y_2p_{(m-1)}$	...	$-b_{22}y_2p_2$	$-b_{21}y_2p_1$
y_1v_1					$-\beta_1 B_1$	$-b_{1(m-1)}y_1p_{(m-1)}$	...	$-b_{12}y_1p_2$	$-b_{11}y_1p_1$
Sector 3					Sector 4				

Table 1. Matrix of closed economic system

- x_i - goods produced in sector 1 (consumed in sector 4), $i=1,2,\dots,m$;
 p_i - value of goods x_i (equilibrium price), $i=1,2,\dots,m$;
 y_j - goods produced in sector 4 (consumed in the sector 1), $j=1,2,\dots,n$;
 v_j - value of the goods y_j (equilibrium price), $j=1,2,\dots,n$;
 a_{ij} - consumption of recourse j for production of unit of product i (technological coefficients);
 b_{ji} - consumption of product i for reproduction of unit of recourse j ;
 α_i - the rate of surplus product (save resources) in the production of good i ;
 β_i - the rate of surplus product (save resources) in the production of good j ;
 P - gross surplus product (save resources) in the sector 1;
 S - gross surplus product (save resources) in the sector 4;
 Q - gross consumption in debt;
 I - gross investment;
 S' - saving from consumption in debt;
 P' - surplus product (save resources) in the production of investment goods.

As in the sector 1 as well in the sector 4, the value of produced goods is greater than the sum of the values of goods consumed in the process of their production. As is already noted, all agents are both producers and consumers. If all economic agents are presented as producers of goods, the difference between the value of goods produced and consumed will take the form of surplus value. But if all agents are presented as consumer of goods, this difference will take the form of saved value. Accordingly, in the first case the surplus value is materialized into the surplus product, and in the second case, the saved value is materialized into saved resources.¹³ Agents are interested in increasing the surplus product and saved resource. Production of surplus product requires entrepreneurial risk, but for saving of resources abstinence is necessary. Since each agent simultaneously is a producer, which produces the surplus product and the consumer, which saves resources, so they simultaneously perform a function of entrepreneur as well as the function of saver.¹⁴ Thus, in order to receive excess of value during the process of production and consumption of goods by the economic agents both risk and abstinence are needed. Reward for risk and abstinence just are the profits and savings.

2. Description of the model: Constants: a_{ij} , b_{ji} . Variables: x_i , y_j , p_i , v_j , α_i , β_j .

1) If all the agents are presented as producers, then:

$$A_i = \sum a_{ij} x_i v_j ; \quad i = 1,2 \dots m; \quad j = 1,2 \dots (n - 1); \quad (1)$$

$$B_j = \sum b_{ji} y_j p_i ; \quad i = 1,2 \dots (m - 1); \quad j = 1,2 \dots n; \quad (2)$$

$$(1 + \alpha_i) \sum a_{ij} v_j = p_i ; \quad i = 1,2 \dots m; \quad j = 1,2 \dots (n - 1); \quad (3)$$

$$(1 + \beta_j) \sum b_{ji} p_i = v_j ; \quad i = 1,2 \dots (m - 1); \quad j = 1,2 \dots n; \quad (4)$$

$$\sum a_{ij} x_i = y_j ; \quad j = 1,2 \dots (n - 1); \quad i = 1,2 \dots m; \quad (5)$$

$$\sum b_{ji} y_j = x_i ; \quad i = 1,2 \dots (m - 1); \quad i = 1,2 \dots m; \quad (6)$$

$$\alpha_0 = \frac{\sum_i \alpha_i A_i}{\sum_i A_i} \quad i = 1,2 \dots m; \quad (7)$$

$$\beta_0 = \frac{\sum_j \beta_j B_j}{\sum_j B_j} \quad j = 1,2 \dots n; \quad (8)$$

$$x_i \geq x_{\min}; \quad i = 1,2 \dots m; \quad y_j \leq y_{\max}; \quad j = 1,2 \dots n. \quad (9)$$

¹³ It should be added that the primary resources, saved in sector 4 are saved from their use for current consumption and not from the consumption in general. They are used for investment and, therefore, are consumed in the production of capital goods (depreciation and net increase of capital) and inventory. For primary resources are services of production factors. But the services cannot be saved in another way than in the form of goods produced by them (i.e. in materialized form) or in the form of money from selling of these goods.

¹⁴ Since saving of primary resources is possible only in the form of investments, so the saving is associated with investment risk.

2) If all the agents are presented as consumers, then:

$$A_i = x_i p_i ; \quad i = 1,2 \dots m; \quad (10)$$

$$B_j = y_j v_j ; \quad j = 1,2 \dots n; \quad (11)$$

$$\sum a_{ij} v_j / (1 - \alpha_i) = p_i ; \quad i = 1,2 \dots m; \quad j = 1,2 \dots (n - 1); \quad (12)$$

$$\sum b_{ji} p_i / (1 - \beta_j) = v_j ; \quad i = 1,2 \dots (m - 1); \quad j = 1,2 \dots n; \quad (13)$$

$$\sum a_{ij} x_i = y_j ; \quad j = 1,2 \dots (n - 1); \quad i = 1,2 \dots m; \quad (14)$$

$$\sum b_{ji} y_j = x_i ; \quad i = 1,2 \dots (m - 1); \quad i = 1,2 \dots m; \quad (15)$$

$$\alpha_0 = \frac{\sum_i \alpha_i x_i p_i}{\sum_i x_i p_i} ; \quad i = 1,2 \dots m; \quad (16)$$

$$\beta_0 = \frac{\sum_j \beta_j y_j v_j}{\sum_j y_j v_j} ; \quad j = 1,2 \dots n; \quad (17)$$

$$x_i \geq x_{\min}; \quad i = 1,2 \dots m; \quad y_j \leq y_{\max}; \quad j = 1,2 \dots n; \quad (18)$$

As we see, according to these formulas in both cases, the equilibrium price and the equilibrium quantity of goods are formed on the basis of recursive processes, and the equilibrium condition is equality: $\mathbf{P} = \mathbf{Q} = \mathbf{I} = \mathbf{S}$, and hence equality of average rate of profit α_0 and the average rate of saving β_0 . Under competitive conditions α_0 and β_0 strive for equality and thereby cause a tendency toward equality $\mathbf{P} = \mathbf{Q} = \mathbf{I} = \mathbf{S}$ and thus to equilibrium of entire system.

Technological coefficients are the coefficients of transformation of primary resources into final products, and consumer coefficients – of final products into the primary resources. Prices are coefficients of exchange of money for goods and, accordingly, transformation coefficients of income into expenditures and expenditures - into incomes.

3. Under the conditions of equilibrium the gross profit is equal to gross consumption in debt ($P = Q$), and gross savings - to gross investment ($S = I$). Under equilibrium conditions, the leakage from producers' incomes in the form of withdrawn profits P , must be compensated by the inflow of funds in the form of loans for productive investments I . But leakage of funds from consumers' incomes in the form of savings S must be offset by inflows of funds for the financing of consumption in debt Q . That is, in the market of resources the condition of maintenance of demand at the appropriate level is the equality $P = I$, but on the market of products such condition is the equality $S = Q$. Otherwise, the balance between supply and demand (at current prices) is violated in the resource market as well as on the product market. But what is leaked from the sector 4 in the form of savings S under equilibrium conditions must be equal to that, which through the money market inflows into the sector 1 in the form of productive investments I . And what is in the form of withdrawn profits P outflows from the sector 1, should be equal to that which in the form of consumption in debt (consumer investment) Q inflows into the sector 4. This is reflected in the model, according to which production investments (investments in physical capital) I and gross savings S correspond to the same element of diagonal of the sector 2. Therefore, under equilibrium conditions $I = S$. Similarly, the consumer investment (investment in human capital, or consumption in debt) Q and gross profit P correspond to the same element of diagonal of the sector 3. Therefore, $P = Q$.

The equilibrium condition is the equality $P = S = I = Q$. So it must have equality $\alpha_0 = \beta_0 = r_0$, where α_0 , β_0 and r_0 , respectively, represent the average rate of profit, saving and interest. However, it should be noted that in contrast to all other commodity and money flows, transforming of P into Q, and transforming of S into I occurs not on the basis of equivalent exchange of goods, but on the basis of credit relations, in which the interest rate r_0 performs the balancing function.

Violation of equilibrium conditions in a system violates the equality between the sum of the elements of rows and corresponding columns. This leads to a bifurcation of the elements of diagonal. There appear discrepancies between production and consumption, supply and demand, cost and utility, production and consumption values. Appear deficient and surplus goods. In the markets of various goods will appear the unsold goods or unused money. In the markets of various goods will appear the unsold goods or idle money. Some get additional profit at the expense of losses of others or lost profits. This creates incentives to restore equilibrium in the markets. At the same time, the imbalance between any one pair of row and column, inevitably gives rise to an imbalance between other pairs of rows and columns. General economic equilibrium will not be achieved until reaching equality $P = S = I = Q$, which means that $\alpha_0 = \beta_0 = r_0$. The equilibrium states can be in infinite number in the conditions of different rates of interest and corresponding to them different values of gross profit, saving, investment and consumption in debt.

4. According to this model, the pricing mechanism, which provides market self-regulation concerning which, beginning with Adam Smith to the present day, are waging fierce debates, proved to be very simple. This is a recursive nature of pricing, i.e. the processes similar to that inherent in many complex non-linear dynamic systems (whether physical, chemical, biological, social, cognitive, etc.). The price system is a functionally closed self-referential system. This circular organization of price formation provides self-organization of market processes. At the same time, the economic system always tends to equilibrium due to the fact that the price system seeks to equilibrium prices, which lead to matching of supply and demand, and through them, also to matching of consumption and production. Although the system also constantly deviates from the equilibrium under the influence of external and internal factors inherent in all complex systems. These deviations from equilibrium and the tendency to restore it ultimately at the macro level leads to the fluctuations of economic cycle.

Operational closeness of a market economy allows a deeper penetrate into pricing mechanism. To understand the anatomy of the decentralized economy is necessary to mentally abstract from the "monetary veil" and trace the logic of barter relations. From the perspective of barter a price is the exchange proportion between goods. At that, prices show in which proportions the goods are exchanged not only between individual actors, but also between the various sectors. Moreover, the exchange ratios between sectors, but not between individuals, are just the adequate average market prices. But individual exchange proportions, individual prices in individual transactions fluctuate around these average market prices. In the system of prices, hence, in a system of exchange proportions the sectoral structure of economy is reflected.

The point is that the economy is differentiated integrity in itself. This means that under equilibrium conditions, each of its sectors produces for other sectors as many goods that fully meet the needs of all other sectors. And it itself consumes the products from all other sectors to the extent necessary for such production.¹⁵ But in this case, when all sectors produce for others and consume only what is produced by

¹⁵ This implies total costs necessary for the functioning of the branch, including the consumption of consumer products by the actors involved in these branches. After all, branches cannot function without actors. In the end it turns out that for the production of any goods are needed the goods of almost all other branches.

others, creates a situation, where as a result of the exchange of goods of own production, a system of prices or exchange proportions, through which all that is supplied for sale is purchased, i.e. every effective demand is satisfied. For means of payment for any demand from the sector, are the goods which produced in it and offered in return. That is under equilibrium conditions intersectoral proportions of production, cause the proportion of intersectoral exchange of goods. These exchange proportions actually is a closed system of equilibrium market prices. After all, it is all the same how to express these exchange proportions as $x_A = y_B$ (in the case of intersectoral exchange) or $A = y/x B$, or as $B = x/y A$ (if the price is expressed as the prices of one good, or through the A or through B). The main thing is that in the conditions of differentiated integrity, when all that is produced in the system is consumed within the system, and all that is produced - is consumed, in such conditions for all industries is formed a system of exchange proportions of type $x_A = y_B$, which provides full clearing of markets. But the totality of all exchange proportions precisely is a system of relative prices, which actually regulates the economic processes, but which is hidden behind the "money veil" in the form of absolute (nominal) prices. It turns out that the prices depend on the sectoral proportions. But the sectoral proportions themselves are formed as a spontaneous result of production and consumption of individual subjects, which themselves depend on the system of market prices. Once again turns out the circular causality - the system of market prices forms the sectoral proportions, but sectoral proportions form a system of market prices. But in this case, the circular causality is not a logically "vicious circle", but is a revealed and quite understandable interaction of micro and macro economic processes.¹⁶

5. Self-regulation of a market economy lies in the ability to provide the proportions between economic flows through market interaction of independent subjects. Although, ultimately, these flows are driven by the energy of millions of independent selfish interests of private actors, but, nevertheless, this system of flows as a whole does not depend on the will of separate actors. On the contrary, it itself structures that energy of egoism, causing economic decisions of private actors, and forces them to act one way or another. This very system of interdependent economic flows generates those anonymous forces, which by invisible threads bind private actors into a single economic organism and make them dependent on each other. Although they do not fully understand the logic of this interdependence and think that they are acting only in their own interests. They think that they are independent, because in their actions they are guided only by their needs. However, they do not realize that their own needs are imposed on them by society and, to a great extent are caused by the economic system.

The point is that the structure of economic needs, which should correspond to the structure of production, itself depends on income, ability to pay, and therefore itself depends on the structure of production. That is, the structure of needs is not something given a priori, due to an arbitrary fantasy or subjective will of consumers, under which must be tailored the structure of production. The structure of needs and structure of production mutually shape each other, because we are talking only about the solvent needs, but solvency itself depends on the structure of production, and on the incomes deriving from production (of products and resources). Thus, the structure of economic needs also is flexible and can develop on various alternative trajectories together with the sectoral structure. This provides the possibility of harmony between the needs and the possibilities of their satisfaction and, at the same time, provides the ability to keep dynamic equilibrium between production and consumption in a phase of economic recovery.

¹⁶ Relative to logically "vicious circle" H. von Foerster writes: "What also causes complication is that now the suspicion will be raised that the whole matter of circular causality might be mere logical mischief. We already know this from the theory of logical inference—the infamous vicious cycle: cause becomes effect and effect becomes cause. It is my intent not only to liberate the "*circulus vitiosus*" from its bad reputation,⁶ but to raise it to the honorable position of a "*circulus creativus*", a creative cycle." (Foerster, 2003, 230)

2.3. Business Cycles

On the basis of "symmetric model" business cycle fluctuations can be interpreted as follows. (See. Fig. 1) Under equilibrium conditions, the money flows flowing through tanks (resource market and product market) and the pressures in them are equal, since the leakage of money S and P balance each other as well as the flow of money I and D . Under such conditions, resources and products have the optimal prices. At these prices entrepreneurs receive a normal profit, which they consider as appropriate reward for the burden of entrepreneurial risk. The owners are doing normal savings satisfying them as payment for abstinence.

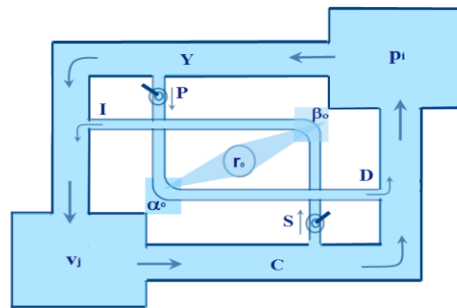


Figure 1. The scheme of circulation of financial flows

In the phase of economic expansion in the economy flows of incomes and expenditures increase. At that, as a result of Keynes psychological law consumers' marginal propensity to save increases and the marginal propensity to consume decreases. As a consequence, on the general background of increasing of all money (and commodity) flows, in consumption sector the share of S increases, and the share of C decreases. On the other hand, as a result of formation of optimistic moods, the marginal propensity of producers to take risks increases. As a consequence of this in production sector opposite processes take place. Increases the marginal propensity to expansion of production (to production consumption) and decreases the marginal propensity to withdrawal of profits (to saving production). Accordingly, in general money flow the share of P , decreases while the share of Y increases.

A result of such redistribution of flows the "monetary pressure" in the upper tank (market products) decreases and in the lower tank (market resources) – increases. Accordingly, the relative prices of the products begin to decline and the relative prices of resources - to increase. But such changes in the system of prices provoke the phase change of economic cycle. A recession begins. The rate of profits is reduced, which leads to a decrease in propensity to take risk. As a result the production is reduced and the consumers' incomes and their propensity to save are reduced, etc. That is, arise opposite trends - the shares of S and Y are reduced, and the shares of P and C are growing. This leads to a redistribution of flow; the ratio of "money-pressures" in the markets of products and resources is reversed. The relative prices of products again begin to rise, and of resources - to decline. Recovery begins.

As a result of these fluctuations of economic activity the money supply required for service of transactions also fluctuates. In the phase of expansion in the circuit are introduced the monetary resources, and in the phase of recession – they are withdrawn. One should keep in mind that although the rate of profit received and withdrawn by producers are different, as well as the rates of savings received and withdrawn by consumers, but changing of the ratios of these norms in the process of expansion and

recession causes only a redistribution of economic flows, but not the changes in the total money supply in the circuit. Input and output of financial resources occurs at the expense of monetary assets of economic subjects. And all these processes of input and output of money in circulation, or redistribution of cash flow, depend directly on the level of interest rates. For level of r_0 effects on the economic decisions and thus it effects on P, S, I, and D and α_0 and β_0 . But P and S are the temporarily available money resources, which form the supply in the money market, and I and D form the demand for money. A supply and demand in the money market form the interest rate through which the economy seeks to restore the "golden ratio" $\alpha_0 = \beta_0 = r_0$ and, accordingly, restore the balance and the optimal ratios between the prices of resources and products.

In conditions of monetary economy the fluctuations of business cycle are the only mechanism that leads into conformity α_0 , β_0 and r_0 , respectively, P, S, I and D. But it does not provide equality, which is necessary for general equilibrium. It only keeps their divergences within certain limits. Decentralized economy is a system with "feedback", i.e. cause-and-effect relationships are closed in a circle and transformed into a functional relationship by which any deviation excites the forces for its self-elimination, which are proportional to the magnitude of this deviation. Natural laws of the market are "blindly" operating laws. The "blindness" is manifested in the fact that the uncontrolled self-stimulation and self-retardation of economy continues until they reach a critical turning points - a maximum production capacity and minimum consumption possibilities. Therefore, without government regulation of economy it is impossible in principle to eliminate cyclical fluctuations.

2.4. Things to think

1. The "symmetrical model" is based on a dialectical analysis of the fundamental economic categories. This analysis revealed such hidden relationships between economic phenomena and processes that are not visible at the empirical level. From the "symmetric model" reflecting these relationships, it is clear that economic processes form a closed system, and the functions performed by these processes are interdependent and have a circular organization. From a purely scientific point of view, it is essential that the model of an economic system, built on the basis of half-forgotten and completely ignored by economists dialectical analysis, and conclusions drawn from the analysis of this model, quite correspond to the provisions and principles of constructivism and second-order cybernetics. That is scientific conclusions and provisions, obtained by various methods and independently from each other, turned out to be completely compatible. Below are a few quotes regarding the circular processes from the book «Understanding understanding» of the founder of second-order cybernetics H. von Foerster:

"It seems that cybernetics is many different things to many different people. But this is because of the richness of its conceptual base; and I believe that this is very good, otherwise cybernetics would become a somewhat boring exercise. However, all of those perspectives arise from one central theme; that of circularity. When, perhaps a half century ago, the fecundity of this concept was seen, it was sheer euphoria to philosophize, epistemologize, and theorize about its unifying power and its consequences and ramification on various fields." (Foerster, 2003, 288)

„ $x' = D(x, u)$, and $u' = S(u, x)$

$x_{t+1} = D(x_t, u)$, and $u_{t+1} = S(u_t, x)$

Those of you who are occupied with chaos theory and with recursive functions will recognize at once that these are the fundamental equations of recursive function theory. Those are the conceptual

mechanisms with which chaos research is conducted; it is always the same equations over and over again. And they give rise to completely astonishing, unforeseen operational properties. Viewed historically, even early on one noticed a convergence to some stable values. An example: if you recursively take the square root of any random initial value (most calculators have a square root button), then you will very soon arrive at the stable value 1.0000. . . . No wonder, for the root of 1 is 1. The mathematicians at the turn of the century called these values the "Eigen values" of the corresponding functions. (Там же, 315)

Easy to see that equations of "symmetric model" reflect precisely the recursive function about which H. von Foerster writes and in which it is easy to "recognize at once that these are the fundamental equations of recursive function theory". Accordingly, the "Eigen values" in this model are the equilibrium prices and equilibrium quantity of goods in respect of which the actual prices and quantities fluctuate.

About 20 years ago there was an explosion of renewed interest in these recursive operations, as one discovered that many functions develop not only stable values but also a stable dynamic. One called these stabilities "attractors," apparently a leftover from a teleological way of thinking. Since one can let some systems march through the most diverse Eigen behaviors by making simple changes in the parameters, one soon stumbled onto a most interesting behavior that is launched by certain parametric values: the system rolls through a sequence of values without ever repeating one, and even if one believes one has taken one of these values as the initial value, the sequence of values cannot be reproduced: the system is chaotic. (Там же, 316)

To the 'Eigen behavior', about which von Foerster writes, within the economic system corresponds the algorithm of cyclical fluctuations of system relative to the equilibrium state, because these fluctuations are caused by the system itself, by intersystem endogenous factors. The environment makes only adjustments to the dynamics of these fluctuations, to the length of their phase, and to the amplitude of the waves, etc.. But the impulses of environment are not the direct cause of these fluctuations.

Through this recursive closure and only through this recursive closure do stabilities arise that could never be discovered through input/output analysis. What is fascinating is that while one can observe these stabilities it is in principle impossible to find out what generates these stabilities. One cannot analytically determine how this system operates, although we see that it does operate in a way that permits us to make predictions. (Там же, 316-317)

From the analysis of "symmetric model" it may be concluded that the system tends to equilibrium in accordance with its internal nature. However, it is impossible to know exactly in which way this equilibrium has been achieved, which specific processes lead to it in a particular case, since one and the same state of equilibrium can be achieved by an infinite number of ways. That is, we know attractor, the state toward which the system tends, but it is impossible in principle to determine how it will be achieved.

As we can see the mechanism of self-regulation of market economy was quite simple. This is a recursive process in a functionally closed system. To find out this has become possible only after the market economy was presented as a functionally closed system of economic processes. But to present it in this form has become possible only as a result of dialectical analysis of economic phenomena. This fact once again confirms the necessity of dialectical method for economic theory.

2. After when in the early '50s K. Arrow, J. Debreu and independently of them L. Mackenzie published their general equilibrium models, the mathematical direction of economic theory has received the new impetus to development. By intellectual efforts of these authors was laid the

foundation of modern mathematical models of decentralized economic system. For several decades appears a steady stream of works on the theory of general equilibrium. Some scientists have even considered the results obtained in this field of science as one of the most significant achievements of mathematical branch of economic theory in the second half of the 20th century. This model has become an integral part of modern neoclassical paradigm. However, critics of this model rightly point out that, although, from a purely mathematical point of view, in it really "gracefully" is proved the existence of general equilibrium, but it is so abstract that is hardly seen through allusions to the economic reality.¹⁷ Indeed, assumption on which the model is built, conditions for the existence of general equilibrium and the conclusions drawn from the model are completely unacceptable for an impartial scientific analysis. In an attempt to create an adequate model of general equilibrium, mathematical economists are so carried away with the purely mathematical side of the problem that involuntarily embarked on the path "leading nowhere". For example, Mark Blaug writes:

“The Arrow-Debreu paper provided a rigorous proof of the existence of multimarket equilibrium in a decentralized economy, This proof was rigorous by mathematical standards but it required some assumptions that clearly violated economic reality; for example, that there are forward markets for every commodity in all future periods and for all conceivable contingencies In short, the Arrow-Debreu proof had more to do with mathematical logic than with economics..... it has become a perfect example of what Ronald Coase has called “blackboard economics,” a model that can be written down on blackboards using economic terms like “prices,” “quantities,” “factors of production,” etc. but which nevertheless is palpably unrepresentative of any recognizable economic system.” (Blaug, 1997, p.3).

Similar is the position of Steve Keen:

“ It is almost superfluous to describe the core assumptions of Debreu’s model as unrealistic: a single point in time at which all production and exchange for all time is determined; a set of commodities – including those which will be invented and produced in the distant future – which is known to all consumers; producers who know all the inputs that will ever be needed to produce their commodities;” (Keen, 2011, p. 201)

The theorem of existence of a general economic equilibrium Arrow and Debreu proved using the Kakutani theorem about fixed point. These fixed points, or otherwise "eigenvalues" exactly are the equilibrium prices that ensure the equilibrium of system. However, this method of proving the "existence theorem" became possible only under the absurd assumptions (named above are only some of them). But, as Heilbroner wrote, "...«The Arrow-Debreu formulation fails to deal with the need to enumerate all such contingent markets – for example, the preference map for umbrellas next Tuesday. Without such a complete enumeration, the general equilibrium specification cannot be complete, and there can be no assurance that even minute omissions may not give rise to considerable variations in the overall ordering....” (Heilbroner, 127) In addition, adds Heilbroner,

¹⁷ In this respect, it is interesting the wording of official rationale of Nobel Prize awarded to Debreu in 1983 - "For his contributions to our understanding of the theory of general equilibrium and the conditions under which the general equilibrium exists in some abstract economy."

there is another conceptual key question, which concerns the circularity: « The array of prices and quantities that emerges from the interaction of monads arises from the tastes and capacities of the actors. These in turn reflect their initial endowments of income and preference. Circularity enters insofar as the division of income into wages and profits, which certainly shapes the propensities of the actors, is itself the consequence of the functional division of income in the preceding period. This endless regress deprives the array of simultaneous equations of the very thing needed to establish order – namely, a knowable, objective starting point of premise. (Ibid.) “.

All these problems do not occur in the "Symmetric model" since the very understanding of equilibrium concept is different from the understanding of equilibrium in Arrow-Debreu model. Under the equilibrium the Arrow-Debreu model meant such state of economy in which it may reside under certain conditions in some moment of real-time and shows what will be in this case the absolute values of equilibrium price and quantity of goods in absolute terms. At the same time, although it is clear, that such conditions are completely unrealistic, and the economy itself is very abstract, but if even so we assume that these conditions can be fulfilled, it is assumed that equilibrium will be achieved in real time, which flows from the past to the future. Therefore, it was necessary to know the state from which the system began to move toward the equilibrium point, as well as all future prices, production plans, needs, accidental circumstances, etc. (Because the subjects make decisions in the present with considering the future.) For this, it was necessary to make these completely absurd assumptions that make this model unreal.

However, unlike the Arrow-Debreu model, the "Symmetric model" is not a model of a specific state in any moment of real time, which shows the real prices and quantities in absolute terms. Each price in this model, is a function of all other prices and quantity of each commodity (be it a product or resource) is a function of quantities of all other goods. This model reveals the essence of economic equilibrium. It reveals only proportions between the quantities of produced, consumed and exchanged goods, and those exchange ratios between goods (i.e. relative prices), for which all that is produced is consumed, and all that is consumed is produced. Therefore, all goods exchanged with each other in such proportions that in the market does not stay unsold goods or unsatisfied effective demand. The equilibrium does not depend on absolute prices and absolute quantities of goods (products and resources). The absolute quantities of products can be arbitrary, within the limits bounded from above by quantities of primary resources (and hence, production factors), and from bottom – by minimal acceptable level of final products' consumption. But the magnitude of the absolute prices is almost unlimited, if the equilibrium relative prices remain unchanged. Moreover, the model reflects the formation logic of the infinite multiple sets of mutually compatible relative prices and the relative amounts under which the system will be in equilibrium. "The symmetrical model" does not show any real state of the system at any point of real-time, but it shows only the proportions between the intra-system parameters, the internal state of a decentralized economy, with which it would be under any of the infinite number of possible variants of equilibrium, with very different absolute prices and absolute quantities. Itself equilibrium is understood as a condition toward which the system always strives from any actual state due to inherent logic of intra-system processes, but which, nevertheless, is

never reached, due to the destabilizing effect of external factors.¹⁸ Therefore, there is no need for knowledge of the starting conditions in the past or future circumstances and accidents, nor any specific amounts of goods and nominal prices. Thus, the "fullness" of which Heilbroner wrote and which are necessary for finding of "fixed points" or "eigenvalues" (equilibrium prices), originally already is provided in the "Symmetric model" because of its operational closeness, which a priori encompasses all the possible prices and quantities under given constraints. As for the fact that the circularity "deprives the array of simultaneous equations of the ... objective starting point of premise" (Heilbroner), from the point of view of recursive models, this fact is not a shortcoming of the model, but a significant advantage, which does not hinder the emergence of "fixed points" and, consequently, of equilibrium prices and of general equilibrium.¹⁹

As an illustration, we can use the example given by Foerster. If recursively repeating the same operation of extracting the square root, then starting with the extraction of the root from any rational number, eventually, we will inevitably get "1". This "1" is an eigenvalue of this operation and kind of attractor or equilibrium state, which "attracts" to itself the results of recursive operations. However, if because of external circumstances (inattention, ignorance, fault of calculator, etc.) interim results of these operations deviate from their exact value, the "1" (equilibrium) will never be achieved, but the tendency to this direction will always exist.

Similarly, due to the inherent logic of recursive operations, the intersystem processes lead the decentralized economy to the equilibrium state, as to the "attractor". Therefore, to know the initial state of the system is not necessary, because it will always move towards the equilibrium from any other state. However, due to constant influence on the system of random external factors, the general equilibrium is never achieved. And degree of deviation from equilibrium depends on the strength of the disturbing effects of random external factors. Economy always strives for equilibrium, but never reaches it.

3. The operational closeness and causal openness of complex systems

1. The principle of operational closeness makes understandable how arises and how functions the economic system, and how order arises in it. Concerning the social systems in general, which include also the economic system, the German sociologist Niklas Luhmann writes that the operations in such systems always occur within the system. If the operation of the system took place in the external environment, it would have lost the meaning of difference between the system and its environment. Namely, this claims the thesis of operational closeness. (See, Luhmann, 2007, 95). The thesis state that the systems are operationally closed. They are entirely based on internal operations. But this does not mean that there is a return to the old theory of closed systems, and hence to the problem of entropy. The fact is that inside the

¹⁸ These factors can be natural conditions, social processes, new technologies, consumer preferences, propensity to risk and propensity to save, etc., the impact of which in the model are reflected in the changes of technological and consumer coefficients, rates of profit, rates of savings and interest rates.

¹⁹ «... by closing the causal chain one also appears to have gained the advantage of having gotten rid of a degree of uncertainty: no longer does one have to concern oneself with the starting conditions—as they are automatically supplied by the end conditions.» (Foerster, 2003, 230)

theory of operational closeness now it is necessary to distinguish between the operation and causality. (Ibid, 96) The principle of operational closeness in sociology N. Luhmann introduced from second order cybernetics. This cybernetic approach, which was developed by the University of Illinois physicist H. von Foerster, biologists U. Maturana and F. Varela, proved to be extremely effective for the analysis of the problems of social order formation for many reasons.

“First of all, the idea of closed circular causality has the pleasant characteristic that the cause for an effect in the present can be found in the past if one cuts the circle at one spot, and that the cause lies in the future if one does the cutting at the diametrically opposed spot. Closed circular causality, thus, bridges the gap between effective and final cause, between motive and purpose. Secondly, by closing the causal chain one also appears to have gained the advantage of having gotten rid of a degree of uncertainty: no longer does one have to concern oneself with the starting conditions—as they are automatically supplied by the end conditions.” (Foerster, 2003, 230)

2. Each subsystem of social system for the normal functioning needs the products of functioning of other subsystems. Therefore, each subsystem can function normally only if all other subsystems are functioning normally, and if they provide each other with their products. Failures in the functioning of any of them will inevitably affect the functioning of other subsystems. This means that all the functions performed by the various subsystems of society are interconnected, form a closed structure and are necessary for each other and for the society as a whole. The same is true for the economic subsystem. Each of its sectors and every economic action perform certain functions that are necessary for the functioning of other sectors, for performing other actions. They are interrelated functionally and form a closed functional integrity.

According to Luhmann social system and its environment arise on the basis of recursive processes. At that the system and its environment occur simultaneously. For each system has its own environment. There is no system without external environment, as well as there is no environment without that system relative to which it is the external environment. He writes that under the "closeness" is meant not the thermodynamic isolation, but only the operational closeness, which means: the recursive condition of opportunities of own operations on the basis of the results of own operations. Such recursive relationship in which the completion of one operation is the condition of possibility for some other operation, lead to the formation of system, whose closeness is often realized thanks to complex structures; and lead to the fact that the external environment exists simultaneously with them. This result he calls the operational closeness. (Luhmann, 2004, 51)²⁰

3. The operational or functional closeness implies that the realization of one function is the condition for realization of another function. Ultimately, they are interconnected in such a way that they create a base of existence for each other. That is, in the system appear recursive operations, which are the condition of system's autonomy. At the same time it should be noted that an operational closeness reproduces itself. This is not the result of the plan, drawn up in advance by any actor. This operationally closed system reproduces itself by the fact that each economic action logically creates "its other" action. This is similar to the construction of the genetic code, where the matrix does not exist in a physical form, but in the form of the sequins of actions and functions; when for their completion they require "its other" function or action.

²⁰ “No system can advance into the future faster than others and thus lose the simultaneity required for contact with the environment. Even if "time," following Einstein, permitted this, the system would remain glued to its environment. The difference between system and environment can only be established simultaneously. Thus the ongoing linkage between system and environment presupposes a common chronology.” (Luhmann, 1995, 185)

And this chain of interconnected functions is locked in a closed system, in which all functions, one way or another, generate each other. In one of his scientific reports H. von Foerster said:

“You all know about the unprecedented successes of the recursive functions that are in constant use in chaos theory and indeed elsewhere. But I have the feeling that these results of chaos research can be applied by sociology only metaphorically. Why? All chaos research is concerned with functions, and functions are only relations between numbers, at best, complex numbers. A function can be quadratic, one gives this function a two, out comes a four, and one gives this function a three, and out comes a nine. It operates only on numbers, but sociology doesn’t work with numbers: sociology is interested in functions. And functions of functions one calls functors. A functor is, so to speak a system that is intended to coordinate one group of functions with another group, and so today I propose to develop a research program in which one is concerned with recursive functors. So that’s problem number one.” (Foerster, 2003, 306)

Every economic action performs a specific function, as a result of which is born another action. This new action, in turn, also performs some other function, which is derived from the previous function and, herewith, determines the function of subsequent actions, etc. Because of the circular organization of these functions the sequence of performed actions is repeated indefinitely until there exists a circular organization of these functions. But these functions are performed by the actions themselves. That is, a circular organization of functions generates such a sequence of actions through which the functions performed by these actions are organized circularly and create a closed structure. In other words, functionally closed structure creates such sequence of actions of a particular type, which causes a circular organization of functions. Ultimately it turns out that the functioning of social system depends on itself. But the dependency on itself is independency from the others, is the autonomy. A functional or an operational closeness is the basis of autonomy.

4. To the social actions correspond definite causal processes in the empirical world. But the causal processes by themselves are not the social actions. Social actions are perceived and exist only in a teleological coordinate system, in intersubjective space, but the causal processes - in space-time coordinate system. That is, in this case we have the perception of one and the same processes in different dimensions. But, despite the fact that the empirical processes and phenomena are generated by social actions and are interrelated by causal links, they do not constitute a single system as a separate part of spatio-temporal world. These causal processes do not stand out on the general background of encompassing causality of whole universe. These empirical processes and phenomena are perceived as expedient actions and as a system of social actions only in the consciousness of transcendental subject and in the intersubjective space and only thanks to the sense, which people put in them, due to their perception in a teleological context.

5. Economic values stipulate economic actions, and they, in turn, stipulate certain causal processes (physical, chemical, biological, and others.), which alter reality. As a result of these empirical processes changes both the man himself and his environment. But as a result of changes of empirical reality also change human values, including economic values; for value is nothing more than a teleological relation of man to the present reality, in which he sees opportunities to meet his needs. Values represent a kind of link between the real world and a system of actions.

That is, there is a relationship, on the one hand, between the economic values and a system of actions that have only phenomenological being and, on the other hand, between the causal processes of real world. Not only operationally closed system of values and actions influences the environment, but also the external environment influences the system. But the system of actions and the empirical world do not

intersect each other. Economic values and actions (as acts of spiritual activity) cannot penetrate into the space-time world of causal processes. But also the causal processes from the world cannot penetrate into the purely subjective world economic actions. Although both these worlds influence each other, but they retain their autonomy and independence. But autonomy does not mean isolation. Empirical world itself is a system and the changes in it are made not only by the system of actions. In the environment there take place also many other processes, which by a system of actions are perceived as accidental external factors (natural processes, natural disasters, social catastrophes, devastating wars, etc.).

6. In a market economy all subjects are producers and consumers. All of them consume that is produced by other and produce what is consumed by other. Therefore, producers of this good attract to themselves consumers of this good, which simultaneously are producers of other goods. At the same time, they repel other producers of the same good, because compete with them as purchasing power of consumers is limited. That is, producers of similar goods are repelled, compete with each other, but the producers of dissimilar goods - attract, cooperate with each other. Accordingly, buyers of similar goods compete with each other (for the opportunity to buy from the most pliant seller) but buyers of dissimilar goods are attracted to each other (in order to exchange). Thus, competition and cooperation mutually generate each other and are inseparable from each other.

7. The market mechanism channelizes the uncoordinated actions of formally independent economic subjects and by that generates commodity-money flows, which are interconnected in a single closed system. Each act of interaction of subjects generates mutually opposite movement of equal by value goods and money. Accordingly, all the plurality of different actors' actions in their totality generates the counter flows of commodity and money. And since these flows exist within a single system of economic actions in which the result of each action serves as a means for other actions, then these economic flows are locked into a single system of two closed parallel mutually opposite flows of goods and money, which are mirror-symmetric relative to each other and which balance each other. These flows of money and goods are interconnected like opposite poles of a magnet. Through the impact on money flows it is possible to affect the flow of goods and vice versa.

Economic flows shown in the "symmetric model" are formed spontaneously. They are self-organized spontaneously due to the mechanism of economic equilibrium, according to which the clash of opposite economic interests of subjects determines balancing of mutually opposite economic processes. Production is balanced by consumption, demand - by supply, buying - by selling, investments - by consumption in debt, making gross profit - by making gross saving, etc. If balance is lost the symmetry of economic flows as a single system of mutually balanced economic forces is broken. There appears an imbalance, which is aimed at restoring the balance. That is because of this symmetry and mutual balancing of economic interests happens the sewage of all economic processes and maintaining of boundaries of fluctuations of flow within acceptable limits, allowing to save the integrity of economy as a closed system of economic actions.

8. The open system always remains only partially autonomous. That is, it is independent from the external environment only in some respects, but in other respects it depends on it. The system responds only to some external factors and is neutral to all other processes in the external world (if they do not destroy the system). Therefore, not all changes in the outside world should rank as "input" signals, but only a small part of them. In this sense, the system of economic actions is **functionally closed** and **causally open**.²¹ It is closed in the sense that the causal processes of environment do not penetrate into it. And open

²¹ At first Luhmann divides the concept of operational closeness and causal openness and indicates that exactly the operational closeness constructs an object, system, which is capable to aware the causal relationships. Without

in a sense that it is not isolated from the environment. It only responds to the important for the system changes in the environment. At the same time the system ignores all other external factors that have no value for the system. Takes place so-called "reduction of complexity" (Luhmann). That is, the system reacts selectively only to certain changes in the environment, but no causal processes from the environment penetrate into it, since they exist in different dimensions. In this regard, Luhmann writes that complex systems with a high degree of autonomy are both independent and specifically dependent. In modern society, the economic system, the legal system or the political system are independent to a great extent. But also to a great extent they are dependent on their environment. If the economy is not prospering, then difficulties begin in politics, and if politics cannot provide certain, for example, legal guarantees, or if political intervention is too large, it creates the problems in economy. Therefore, returning to the theme of operational closeness, it is necessary to distinguish a causal dependence / independence on the one hand, and on the other hand, the operations performed by the system itself. (Luhmann, 2007, 121)

The impulses, received from environment by the effects of causal processes on the system of actions, inside the system get specific continuation in accordance with the structure of intra-system functional relationships having circular organization. In other words, the system starts in its own way specifically react to impacts from the environment and, accordingly, it also has a specific impact on its environment by that it in its own way converts "input" impulses into "output" impulses. The operational closeness of economic system provides a constant tendency of the system to equilibrium. But the causal openness of system, the system's exposure to external influences of environment is constantly striving to disturb the equilibrium of system without which its development would be impossible. Both together, the synthesis of operational closeness and causal openness provide economic development.

9. At that, the actors are not aware of this functionally closed system as integrity. They only fragmentary realize those functions and roles which are directly related to the functions they perform. That is, they are aware of only a few fragments of the above-mentioned system; they see the function of only those subjects with which they have to directly engage in economic relations. But they do not realize that the functional relations, which their counterparties have with their counterparties, and those in turn with the other and so on, that all these relationships ultimately are closed, return to it through the same counterparties and form an operationally closed structure, which is precisely the "invisible hand" in subconsciousness of society, directing their actions and regulating economic processes.

According to structuralism behind the conscious manipulation of signs, words, images, symbols can be found unconscious deep structure, hidden mechanisms of semiotic systems. Scientific objectivity of research may be provided just by the study of these structures of unconscious. These latent regularities to which unconsciously obey man, correspond to some deep layers of culture. Just they mediate the relationship of human consciousness and the world. It turns out to be that consciousness and self-consciousness, which ignore this mediation by the deep unconscious structures, turn out the source of illusions about free and sovereign activity of human Ego.

To a certain extent, aforesaid is true for the economic system. The "symmetrical model" just reflects these unconscious by society deep structures of social unconscious, the deepest layers of the unconscious relationships between economic actions of subjects that are not visible behind the outside chaos of economic phenomena. But as soon as these structures are cognized, the person gets the opportunity to act in accordance with these structures consciously and in their interests and not be forced to blindly obey

them as to unknown and incomprehensible forces. Yet Socrates argued that the power of man over nature is based on the submission to its laws. On the same principle should be based man's power over the market economy and then it becomes already the regulated economy. But for this you need to know its laws.

Conclusion

1. To understand the functioning of a market economy is necessary dialectical analysis of economic phenomena and processes. As a result of this study economics appears as operationally closed complex nonlinear system of economic actions, which have a number of properties that have been well studied in synergetics, constructivism and second-order cybernetics. This allows to draw for the study of economic processes the unique scientific developments of these disciplines in the form of interdisciplinary analysis. Sociology has long used with great success structurally functional approach for the analysis of social systems, to what also refers economic system. Analysis of the economy as a social system in the context of "meta-theory" of T. Parsons and N. Luhmann clarifies many issues of economic theory. In this regard, of particular importance are many ideas of T. Parsons, relative to the system of social actions, and N. Luhmann, regarding the operational closeness and causal openness, autopoiesis and self-reference of social systems, etc. As a result, of interdisciplinary analysis of decentralized economic system we get an entirely new interpretation of economic categories and relationships between them, a new understanding of economic equilibrium, cyclical fluctuations and other processes.

2. In contrast to the natural sciences, in social sciences, theories are able to change the way of system's operation. Economic reality is formed by collective actions. But collective actions depend on the knowledge gained from the cognition of economic reality. When physicists changed their ideology from classical Newtonian mechanics to modern quantum mechanics, the behavior of the atom has not changed. But theories developed by A. Smith, K. Marx, J. M. Keynes, M. Friedman and others have changed the behavior of economic systems.

3. The main contradiction that drives economic system - is that each subject consumes that produces another, and produces what consumes another. Therefore, wants to buy what has the other, and, to sell what the other wants. That is, the satisfaction of own needs is mediated by the satisfaction of others needs. Because of this by their actions all subjects are attached to each other and form a single whole, a system in which the law of symmetry is fulfilled - all that is produced is consumed, and all that is consumed - is produced.

Moreover, each of economic actors simultaneously is a producer and consumer, seller and buyer, investor and consumer in debt, entrepreneur and saver, creditor and debtor. It is impossible to be a producer of goods, not being a consumer of others' goods, and it is impossible to be a consumer, not being a producer, and is impossible to be neither one nor the other, without being the seller of own goods and the buyer of others' goods, and it is impossible to be neither seller nor the buyer of goods not being the buyer and seller of money.

In such conditions each economic action generates another action. That is, there arise the recursive processes, thanks to which the economic system becomes a closed self-reproducing system and is likened to a living organism, which itself generates the cells of which it consists. Such self-reproducing systems are called autopoietic systems, which are studied in the framework of second order cybernetics and constructivism.

"Autopoiesis is a notion that requires systemic closure. That means organizational, but not necessarily thermodynamic, closure. Autopoietic systems are thermodynamically open, but organizationally closed. Without going into details I would like to mention that the concept of closure has recently become very popular in mathematics by calling upon a highly developed branch of it, namely, Recursive Function Theory. One of its concerns is with operations that iteratively operate on their outcomes, that is, they are operationally closed. Some of these results are directly associated with notions of self-organization, stable, unstable, multiple and dynamic equilibria,"
(Foerster, 2003, 281)

4. The property of self-organization leads the economic system to a state of equilibrium. In a market economy there is a counter directed movement of commodity and money flows, which form a closed loop. These counter flows balance each other and form a single system, to which is inherent the symmetry property. The state of equilibrium - is the state of symmetry. Self-organization implies the restoration of inner harmony and symmetry of economic system in which the integrity of economic system is restored. In this state all the elements of system are necessary parts of the whole. Here are precisely followed all proportions; there is no deficits and no surpluses.

5. The "symmetric model" is an attractor, i.e. it is relatively stable, latent structure, to which inevitably yield the processes of development in a market economy, as to causally open non-linear system. Nonlinear mathematical models of complex systems show that such systems "hide" a certain form of organization of intra-processes, which are caused solely by their own non-linear properties. That is, these structures _ attractors can be interpreted as a teleological structure, which determine the main evolution tendencies of the system. The idea of "attractor" in chaos theory resembles the concept of the essence in dialectics, and the ideas of ancient thinkers about the potential and unmanifested. In particular it is conformable with Plato's notion about some of the first-samples and perfect forms in the world of ideas, to which the things of visible, always imperfect world tend to be like. Or to the notion of Aristotle on the entelechy, about some internal energy, inherent in matter, and forces it to finding a certain form.

6. The symmetry literally permeates the entire world around us.²² The concept of "symmetry" is generally used in two senses. In one sense, symmetrical means something proportional; symmetry shows that way of harmonizing of many parts with which they are united into a whole. The second meaning of the word is - balance. The economic system manifests the symmetry property in both these senses. Various economic flows are mutually agreed upon; they complement and balance each other, forming a single unit as a self-regulating system with "feedback". The famous German mathematician, physicist and philosopher Hermann Weyl wrote in his "Symmetry": "state of equilibrium must be apparently symmetrical" (Weil, 1968, 55). It follows that the equilibrium model that adequately reflects the economic processes must have the symmetry property.

7. The market economy is a complex nonlinear dynamic operationally closed system in which self-organization is carried out thanks to a recursive process _ commodities are produced by commodities, prices are formed by prices, action are generated by actions, needs generate new needs, etc. etc.. Such

²² Still in the beginning of the 20th century, Academician V. Vernadsky wrote that the new in science was not the revealing of symmetry principle, but revealing its universality. The development of science increasingly confirms this truth. Indeed, the totality of symmetry is striking. Fundamental phenomena studied by cosmology, physics, chemistry, biology, social and other sciences, in one form or another show signs of symmetry. The symmetry underlies the theory of relativity, quantum mechanics, solid state physics, atomic and nuclear physics, elementary particle physics. The realization of that the symmetry, as well as the accompanying it asymmetry inherent in the economy as well as in the rest of nature, allows for a deeper grasp the economic laws. (See, Leishvily, 2011).

recursive processes in the economic system, as well as in other complex nonlinear dynamical systems generate "Eigen values", "Eigen behavior", "Eigen functions", "Eigen algorithms." Just such "Eigen values" are the equilibrium prices and the equilibrium quantities of goods, the "Eigen behavior" are fluctuations in economic activity according to "Eigen algorithm". Like many other complex systems a market economy is both functionally closed and causally open. Accordingly, it simultaneously strives for balance within the system (between the intra-system processes), and is in a non-equilibrium state with respect to the environment. That is, it possesses an inner equilibrium and stability, which is necessary to preserve the integrity of the system and possesses the external imbalance and instability in relation to the external environment, which is a necessary condition for the development of the system. Therefore, it is able to homeostasis, and at the same time is able to develop, modify state, respond to external influences and adapt to the environment. That is capable of dynamic equilibrium.

8. Economic science has long been considered more advanced than other social sciences and put by them as example. As a result, neoclassical economists have formed professional arrogance of superiority that prevents them from being more susceptible to the scientific achievements of other sciences. Talcott Parsons believed that economic science is more advanced than sociology and therefore sociology must accept from there valuable for it ideas. He tried to do this and created the theory of social actions in which were synthesized achievements of systems theory those days, economic theories of A. Marshall and V. Pareto. His disciple Niklas Luhmann, on the basis of system approach, proposed a theory of social systems, significantly enriched with new ideas, also perceived from the achievements of related sciences of his days. Thanks to these scientists and their followers, systematic approach in sociology has been widely recognized and has made a huge contribution to the development of sociology. Today, when economic science clearly is in deep crisis, it is time it itself should "learn" from sociologists. It should not only accept from them the valuable scientific ideas, but the very willingness to accept the achievements of other disciplines.

Appendix A

Sector 1

Sector 2

<p>C_p</p> <p>Costs of production</p>	<p>P_n</p> <p>profit</p>	<p>GDP</p>	
<p>I_g – gross investments into production (consumption on credit of recourses)</p> <ol style="list-style-type: none"> 1. depreciation 2. net increment in physical capital 3. changes of stocks of product 	<p>P_i - profit in production of investment goods</p>	<p>$I = S$</p> <p>I – inflow in production sector</p> <p>S – outflow from the consumption sector</p>	<p>NDP</p>
<p>GNI</p>	<p>$P = D$</p> <p>P – outflow from the production sector</p> <p>D – inflow in consumption sector</p>	<p>S_i - saving from the profits of entrepreneurs (depreciation charge)</p>	<p>D_g - consumption of products in debt (gross investment in consumption sector)</p> <ol style="list-style-type: none"> 1. consumption of entrepreneurs 2. net investments in human capital 3. stock changes of products
<p>NNI</p>		<p>S_n</p> <p>saving</p>	<p>C_c</p> <p>Costs of consumption</p>
<p>Sector 3</p>		<p>Sector 4</p>	

Table 2. Economic flows in a closed economy.

Appendix B

The market of intermediate products

Production of intermediate products

$x'_m p'_m$	...			$- P'_m$	$- a'_{m1} X'_m V'_1$	$- a'_{m2} X'_m V'_2$	...	$- a'_{m(n-1)} X'_m V'_{(n-1)}$		
...		
	...	$x'_2 p'_2$		$- P'_2$	$- a'_{21} X'_2 V'_1$	$- a'_{22} X'_2 V'_2$	..	$- a'_{2(n-1)} X'_2 V'_{(n-1)}$		
	...		$x'_1 p'_1$	$- P'_1$	$- a'_{11} X'_1 V'_1$	$- a'_{12} X'_1 V'_2$	..	$- a'_{1(n-1)} X'_1 V'_{(n-1)}$		
$- P'_m + \sum a' x' v'$	...	$- P'_2 + \sum a' x' v'$	$- P'_1 + \sum a' x' v'$	-	$- a_{11} X_1 V_1$	$- a_{12} X_1 V_2$	...	$- a_{1(n-1)} X_1 V_{(n-1)}$	$- P_1$	
$- P'_m + \sum a' x' v'$	...	$- P'_2 + \sum a' x' v'$	$- P'_1 + \sum a' x' v'$	-	$- a_{21} X_2 V_1$	$- a_{22} X_2 V_2$	..	$- a_{2(n-1)} X_2 V_{(n-1)}$	$- P_2$	
...	-	
$- P'_m + \sum a' x' v'$	...	$- P'_2 + \sum a' x' v'$	$- P'_1 + \sum a' x' v'$	-	$- a_{(m-1)1} X_{(m-1)} V_1$	$- a_{(m-1)2} X_{(m-1)} V_2$	..	$- a_{(m-1)(n-1)} X_{(m-1)} V_{(n-1)}$	$- P_{(m-1)}$	
Consumption of intermediate products					$- a_{m1} X_m V_1$	$- a_{m2} X_m V_2$	...	$- a_{m(n-1)} X_m V_{(n-1)}$	$- P_m$	$X_m P_m$
									$y_n V_n$	
									$y_{(n-1)} V_{(n-1)}$	
							...			
						$y_2 V_2$				
					$y_1 V_1$					

Figure 2. "Symmetric model" taking into account the intermediate production.

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