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Macroeconomic Order from Microeconomic Chaos

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ABSTRACT

In this article, the problem of self-organization of economic processes in conditions of perfect competition, based on the interaction of individual and social economic values and market prices, is considered. On the basis of dialectical analysis, the deep internal unity of production and consumption, supply and demand, utility and costs, and other categories that determine the functional closedness and integrity of economic system as a necessary condition to understand the formation process of a macroeconomic order from microeconomic chaos is shown. A new understanding of market processes' self-regulation mechanism and economic optimization on the methodological basis of dialectics is given. The proposed theoretical explanation of economic processes makes it possible to create more adequate applied economic models and develop an effective economic policy.

KEYWORDS: *dialectics, self-regulation, equilibrium, economic value, market prices, optimality criteria.*

JEL CLASSIFICATION: *A10, B40,D50.*

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Macroeconomic Order from Microeconomic Chaos

1 Introduction

The history of science shows that interest in methodology issues sharply increases during the crisis periods of its development. The same increase in interest in the problems of methodology is taking place today. Ideas offered by the most recent areas of research programs, such as synergetics (Chaos Theory), second-order cybernetics, constructivism, the theory of neural networks, have a huge general scientific potential. Although these ideas are somehow used in some areas of modern economic science, but their potential has not yet been fully utilized. However, the use of these ideas as a methodological basis for achieving more ambitious goals, for a radical change in the economic worldview and the creation of a new economic paradigm that adequately explains economic realities, is impossible until an understanding of internal integrity of economy and the unity of all processes on micro- and macroeconomic levels. But to achieve such an understanding of the integrity of economy is possible only on the basis of a dialectical rethinking of the fundamental categories and the entire conceptual and theoretical arsenal of the economic mainstream.

The theory is in crisis, if the basic tasks set by it cannot be solved by the methods adopted in this theory. In the most visible form, the mainstream crisis manifests itself in the inability to synthesize micro- and macroeconomic theories. All attempts, including those of the New Keynesians, to find the microeconomic foundations of macroeconomics are eclectic. The gap between micro- and macroeconomic theory is a direct evidence of the huge gap between economic theory and economic reality. Economics did not cope with the theoretical understanding of the functioning of a market economy due to an incorrect methodology based on the ideas of positivism and the empiricism associated with it.

According to dialectical analysis, all economic subjects are simultaneously producers and consumers, sellers and buyers. As such, they do not differ from each other and together constitute a certain set of "identical" subjects, whether firms or households. Each of them produces what others consume, and consumes what others produce. Thus, the subjects by their actions are "tied" to each other. Therefore, this set turns out to be an integrity, an organizationally closed system of relations, which is the economic organism of society. In such conditions, each actor and his actions turn out to be part of this integrity.

Moreover, not only the actions of actors determine the functioning of an economic organism, but the functioning of this organism as a whole also determines the actions of individual actors. Not only the actors "create" the society, but also the society "creates" the actors. Actors are part of society. For it turns out that the actor's needs are part of social needs, the actor's production capacities are part of society's production capacities, individual demand and supply are part of social demand and supply, etc. However, the parts and the whole are inseparable. They cause each other. From this it is clear that the actions of various actors, seemingly independent at the microeconomic level, at the macro level turn out to be dependent on each other as well as parts of a single whole.

At the nano- and micro-levels of the economy, the actions of each subject are ordered. They act consciously and rationally. There is no chaos in their actions. The functioning of the economy as a whole is also ordered. Although this is a "spontaneous order" and is carried out in a mode of self-organization, but there is also no chaos. But why, in a market economy, is there a problem of forming order out of chaos? The chaos is not in the actions of the subjects themselves, and not in the functioning of the economy as a whole. The relations between the actions of a huge number of independent subjects are chaotic. The subjects are not directly related to each other and cannot centrally coordinate among themselves the volumes of produced and consumed goods. The interactions between them in the conditions of competition are based on "weak ties" that easily arise and are easily broken under the influence of many random circumstances. Therefore, the relationship between the actions of subjects outwardly looks like chaotic. But it is precisely due to the "weakness" of these "ties" that the economy acquires sufficient flexibility and makes possible the spontaneous coordination of actions and the organization of order at the macro-economic level.

Thus, the actors are independent only in the sense that in their decisions they are free from external coercion by other actors or the state. But they are dependent on market conditions and objective economic processes that spontaneously arise as an aggregated result of the totality of independent actions of these same actors. Thus, the task of science is to find out how from the chaos of uncoordinated actions of different actors, driven by selfish interests, coordinated functioning and order in the economy spontaneously emerges.

At one time, classics tried to explain, through the theory of value, the formation of order from the chaos of the egoistic actions of individual subjects. The problem of value was at the center of their attention. Numerous theories of value (labor, marginalist, cost-of-production, etc.) were put forward. In one way or another, they all turned out to be untenable. All ended with the fact that active studies of the problem of value have ceased altogether and the theory of price has been placed in the center of attention. But this problem is also solved unsatisfactorily and leaves many questions unanswered. «.... the problem of value is not held in much esteem in contemporary economic thought. …. most economists today do not even see the need for a "theory" of value, as distinct from a theory of price, and would in fact be hard pressed to explain the difference between the two. … the neglect of value does not remove the issue from economics but only leads to its covert appearance in harmful form; ...» (Heilbroner, 1983, 104-105) The price is only a manifestation of value, and if the problem of value is not solved, then it is impossible to solve the problem of price. And this, in turn, means that it is also impossible to understand how from the chaos of uncoordinated actions on the nano- and micro-level there occurs order at the macroeconomic level.

This is a problem that exists in economic science since the 17th century in the works of Petty and Locke, and which was most clearly formulated by A. Smith. The metaphor of the "invisible hand" has become the most quoted in the economic literature since the time of A. Smith. But the problem of how the macroeconomic order emerges from microeconomic chaos has remained unresolved. In the most concentrated form, this problem manifests itself in a deep abyss that exists between micro- and macroeconomics. For economy is a single whole, and in it order from chaos arises not at the micro-level and not at the macro level. Order arises from the functioning of the system as a single organism. If the economy is not understood as integrity, it is impossible to understand all of its other problems.

At the same time, the integrity of the economic system is maintained by the organizational or functional closedness of intrasystem processes, and self-regulation is carried out through positive and negative feedbacks that "permeate" the system horizontally, between branches, and vertically, between micro- and macro processes. But how exactly does this work in a market economy?

The purpose of this article is to try to clarify this problem. At the same time, we offer only general outlines for solving the ***purely theoretical*** problem of the self-organization of a decentralized economic system in the conditions of perfect competition. However, in order to facilitate understanding of the basic idea, the format of this article does not include an analysis of problems relating to the existence of the State, monopolies, foreign trade, technological progress, savings, investment and a number of other factors. Although they, of course, introduce a certain specificity into this process, but this does not interfere with understanding the process of self-organization in a market economy[1].

2. Production and consumption

The fact that production is associated with consumption does not need special explanations. But the fact that production itself is consumption and consumption itself is production is not always clearly and unambiguously realized. At the same time, this fact is maybe implicitly implied, but it has never been deliberately built into the supporting structure of the economic mainstream paradigm as a fundamental position on which depends a true understanding of the essence of what is happening and the whole vision of economic reality.

Karl Marx, in his Introduction to ***A Contribution to the Critique of Political Economy***, gives a brilliant analysis of the dialectics of production and consumption. He's writing:

> *"Production, then, is also immediately consumption, consumption is also immediately production. Each is immediately its opposite" (Marx and Engels, 1958, 717). "The identities between consumption and production thus appear threefold: (1) Immediate identity: Production is consumption, consumption is production. Consumptive production. Productive consumption. The political economists call both productive consumption, ... (2) [In the sense] that one appears as a means for the other, is mediated by the other: this is expressed as their mutual dependence; a movement which relates them to one another, makes them appear indispensable to one another, but still leaves them external to each other. Production creates the material, as external object, for consumption; consumption creates the need, as internal object, as aim, for production. ... (3) ... each of them, apart from being immediately the other, and apart from mediating the other, in addition to this creates the other in completing itself, and creates itself as the other. ... Thereupon, nothing simpler for a Hegelian than to posit production and consumption as identical. (Ibid, 719 -720).*

The production of products is the consumption of resources, and the consumption of resources is the production of products. In the final analysis, it turns out that production and consumption are one and the same process of transformation of some goods into others, and in commodity production - the transformation of some commodities into others. But on the other hand, together with the identity of the processes of production and consumption, they are also different and even opposite. In one case, the goods are destroyed, in the other they are created. They can be viewed as two different processes, for that which is created in one process is destroyed in the other. If we consider them in the context of the relationship of two different processes, then the goods that are created in the production process are destroyed in the consumption process. Accordingly, if production and consumption are treated as one and the same process, then economic entities perceive the goods they consume as resources, and the produced goods - as products. That is, resources and products are different goods. But if production and consumption are viewed as two opposite processes, then the products produced in one process serve as consumed resources - in the other and, consequently, the products and resources are the same goods. That is, products and resources, production and consumption, producer and consumer are relative concepts that depend on the actor's relationship to the perceived objects and processes.

The economy as a whole consists of two mirror-opposite, but inextricably interrelated ***sectors*** - the production and consumption sectors. And, each of these sectors in itself is also the unity of production and consumption processes. The ***final products*** of one sector are the ***primary resources*** for the other. They are interrelated through the market exchange of final products; they constitute integrity and cannot function without each other. In conditions of division of labor, each of these sectors consists of a number of branches[2]. At the same time, the final products of branches of the same sector are the primary resources for the branches of other sector[3]. If, in order to avoid confusion, we refer to the primary resources and final products of production sector as "primary resources" and "final products" for the entire economy as a whole, we get that in economic system, the final products are produced from primary resources, and the primary resources are produced from final products.

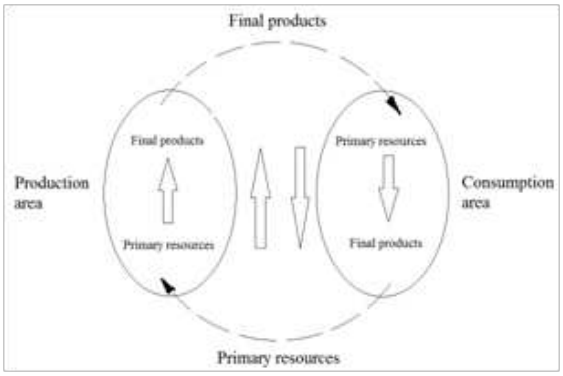

Figure 1. Exchange of final products and primary resources between production and consumption sectors.

The transformation of resources into products that serve as resources for the production of other products has no end and there is a circular process involving the man himself as one of the links. Man is not only a subject, but also the main object of economic activity. This means that a person treats himself as a resource and as a product of his own activity. In the final analysis, man's productive activity is carried out for the satisfaction of his final needs. And in this process, man as a ***labour force*** is the main production factor. And in the result of satisfying his needs, a person reproduces himself as the main subject of activity as an 1) ***entrepreneur*** who consciously takes the production risk to himself; 2) ***saver*** who pursues savings by abstinence; 3) ***owner***, exercising his power over the objects that he produces and consumes. Moreover, it reproduces itself also as a ***consumer*** with its needs. Therefore, the satisfaction of the system of final human needs means the reproduction of the entire system of needs. This means that in the process of activity not only the person and his ability to work are reproduced, but also all factors of production and primary resources. For by themselves, objects are not production factors. They turn into those only in relation to the needs of man. Therefore, even the so-called "non-reproducible" natural resources are "created" by man in the sense that, together with the reproduction of a person, his needs are also reproduced, which transforms the objects of nature into production factors and their services - into primary resources[4]. Thus, a person reproduces

all the conditions necessary for economic activity.

All economic activity appears as a organizationally closed process, in which both the person (as the main resource and product of his activity) and natural objects are involved.

3. Transformation of primary resources into the final products

The primary resources for production are not the factors of production (Labor, Land Capital Entrepreneurship), but their services. However, entrepreneurs buy from the owners of Labor, Land and Capital not the production factors or their services, but the rights to use the services of these factors. For the owners can sell the services of these production factors to the entrepreneur only in the form of selling the right to use these services[5]. Therefore, in a ***purely economic sense***, the primary resources for entrepreneurs are not the services of factors, but the ***right of temporarily use*** of services of these factors. In this case, in order to sell the ***rights of use***, one must be the owner of production factors. To sell these rights to use the services of production factors while retaining these production factors as a permanent source of income, they can only because they do not sell the production factors themselves[6].

As for entrepreneurial abilities as the primary factor of production, they belong to the entrepreneur himself and he does not have to buy the right to use the services of this factor. He himself uses them to produce products at his own risk. His services are embodied in the product he produces. And selling a product to consumers, an entrepreneur sells his services in a materialized form, together with the services of other factors of production embodied in a product.

Reproduction of primary resources as commodities (i.e., the right to use the services of factors and the entrepreneurial services themselves), is reduced to the reproduction of the lives of the owners of these factors[7]. This means it is reduced to the consumption of final products by these owners. It follows that the sector of consumption of final products (in which the human person and his rights are reproduced), is the sector of reproduction of primary resources, and the sector of production of final products is the sector of consumption of primary resource. Each of these sectors produces commodities that are consumed by the opposite sector. Therefore, what is a ***resource*** for one side is a ***product*** for the other. Precisely because of this contradiction, they become necessary for each other, they become necessary parts of a single whole. This whole is precisely what dictates the optimal proportions of social production and consumption. This whole is a market economy "***producing*** commodities through ***consumption*** of commodities".

In a market economy, the division of labor implies that each economic agent produces a single commodity, but for this he consumes many other commodities. At the same time, each of these consumed commodities was produced by some other agent, also specializing in the production of that commodity. Thanks to the division of labor and specialization, the economy will present itself as a network of economic actions of agents that has an organizational pattern similar to the neural network of living organisms[8]. According to certain algorithms, neurons in neural networks convert a set of input signals received through the set of their dendrites into output signals transmitted along their axons to dendrites of other neurons. Similarly, each economic action converts a certain set of resources into a certain product, which itself is consumed as one of many other resources in the production of other products.

In such a neuro-like network of economic actions, in which the products of each action become resources in many other actions, everything that is produced is consumed and everything that is consumed is produced. This is an organizationally closed network. Each action in many parallel, long and short ways is causally connected with any other action. In such closed networks, various positive and negative feedbacks, circular, recursive processes are formed, which are a necessary condition for the self-regulation of complex nonlinear dynamic systems. They are subject to cyclic processes of self-excitation and attenuation, which at the macro-level take the form of economic cycles.

The activities of all entities are carried out according to a certain algorithm. It implies an organizationally closed sequence of functions performed - production, supply, sale, purchase, demand, consumption, production again, etc. At the same time, each of these functions in itself implies its opposite function. Therefore, each action of the subject is internally contradictory. So, for example, the production of a commodity itself is the consumption of other commodities; the supply of goods is the demand for another product (or for money); and vice versa, the demand for a product is the offer of another product (or money); sale of goods is the purchase of another product (or money) and, conversely, etc. However, in a market economy, the actions of one actor imply the corresponding actions of another actor. So, no one can produce a product unless someone else consumes this product. No one will offer a product for sale unless someone else makes a demand for it. No one can sell unless someone else buys, etc. Therefore, the dialectical contradiction is concluded not only in the actions of each subject, but also in the interaction of various subjects. For example, the fact that for one side there is a supply of good and a demand for money, for the other side there is, on the contrary, a supply of money and demand for this good. The same goes for other economic activities. The consumption of goods by one or another subject implies the production of these goods for other subjects.

According to Hegel, dialectical contradiction is the source of all movement. Also in the economic process. As a result of all such actions in the economy, counter flows of various goods are generated that are found on the markets and form a system of relative prices. Relative prices are those exchange propositions in which the economic values of goods are manifested, as genuine regulators of economic processes. But in the process of evolution of the market system, one of the goods that perform the function of money stands out from the commodity world. It drops out of the sphere of consumption and is circulated as a medium of exchange. In the monetary economy, the exchange of goods is mediated by the preliminary exchange of goods for money. Due to this, relative prices are hidden behind the 'money veil' and appear through the absolute, i.e. nominal prices. At the same time, the economic process externally manifests itself as a system of opposing flows of goods and money, and not of the goods themselves. But this does not change the essence of the mechanism of self-regulation. Money greatly facilitates and accelerates economic processes. But the basis of the self-regulation of the economy is the desire of the economy for an equilibrium state, in which each industry produces in accordance with the combined needs of all other industries. It will be shown below that this striving for equilibrium is provided by the incentives generated by economic values and exchange ratios (relative prices) through which they appear on the market.

At the microeconomic level, the network of weak and chaotic interconnections between the economic actions of actors, at the macroeconomic level, takes the form of an ordered, structured and closed self-regulated system of commodity and money flows, in which everything that is produced is consumed and everything that is consumed is produced. On the basis of foregoing understanding of functional (organizational) closure of intrasystem economic processes, the scheme of circular money and commodity flows in a market economy is given below.

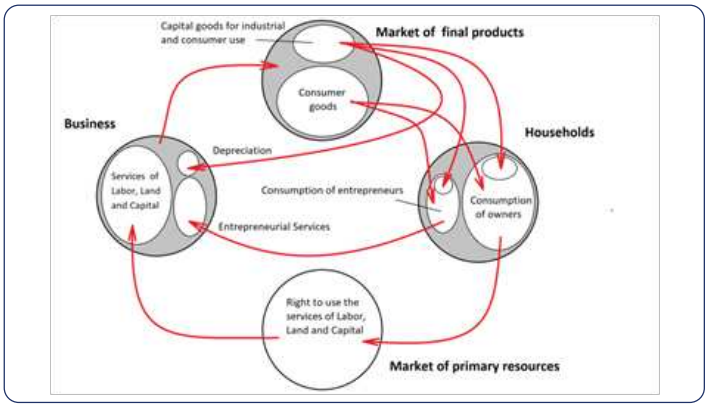

Figure2. Scheme of circular flows of goods and services

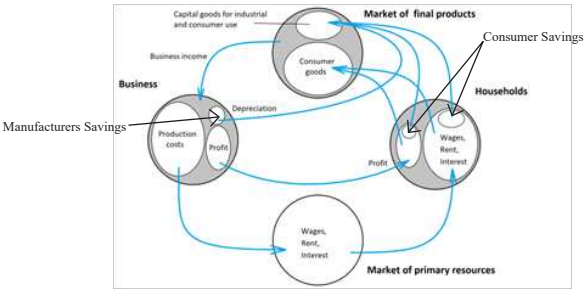

Figure3. Circular money flow of a market economy

As you can see, the income from the sale of primary resources (Salary, Interest, Rent, Profit) are those incomes by which the manufactured products are bought. Thus, in the process of production of goods creates the purchasing power that ensures their realization. (Say's law).

4. Economic structure and relative prices

In a division of labor, all branches of economy produce products for each other. The products of each of them are resources for everyone else. The volumes of their production and consumption come into line with each other through the exchange of products in the markets. In the process of this exchange, the same reflective relations arise as in the sectors of production and consumption. Each party in exchange offers its product instead of the purchased one. Demand is always a solvent demand. If it is insolvent, then it is not valid. But the solvency of demand is ensured by supply. Each party in an exchange simultaneously is both the buyer and the seller. If we take the totality of all branches of economy, then a complete correspondence between their production and consumption is possible only with such proportions of products exchange under which the supply of products of each branch corresponds to the total demand for its product from other branches. It is this reflection between production and consumption, product and resource, demand and supply, purchase and sale, that all branches are transformed into the necessary parts of a single whole[9]. (See, Leiashvily, 2011, 2012, 2017a, 2018.). "In this sense, the whole (wholeness) is the unity of the necessary parts on the basis of the realization of their essential relationship. .... each of them is determined through another. .... The leading factors here are mutual conditionality, an essential link with each other..... As a result, this reflection provides certainty and stability of the whole and all its parts. Here, reflection is embodied in a concrete essential relation. . . . Obviously, the essential relation of the whole is a system-forming. We emphasize that not each system is an integral whole, since its elements and parts are not always necessary, that is, they are not always optimal. Removing of some part may not violate anything." (Yatskevich, 1990, 66-67). "A

classic example is a pile of sand; here the ratio x∈A is purely formal, and there is no point in talking about any optimality. The grains are only indifferent to each other and are not related to each other by essential relationships." (Ibid., p.66).

In our example, an ***essential relation*** is the relation between branches, in which each branch produces goods in accordance with the needs of all branches. It is this essential relationship that is an organizing principle of economic processes that determines the integrity of economy, formation of an optimal interbranch structure and a system of optimal relative prices[10].

If all branches produce goods for each other and exchange them for the goods they consume, then relations between branches will take the form: ***xA = yB***. (where: ***x*** - the quantity of goods ***A***; ***y*** - the quantity of goods ***B***.)[11] Since all branches, and therefore all commodities, are exchanged among themselves in certain proportions, the price of each commodity can be expressed in units of another commodity. So in the case ***xA = yB***, the relative price of commodity ***A = y/xB***, and the relative price of commodity ***B = x/yA***. That is in a competitive environment the system of equilibrium relative prices is formed at the interbranch level, and each commodity has relative prices expressed in all other commodities. Moreover, in conditions of optimality, when each branch produces commodities in exact accordance with the solvent needs of all other branches, and demand is equal to supply. This unique interbranch structure corresponds to a unique system of relative prices. In this state, the economy is in full equilibrium. For this price system is the direct result of exchange ratios between branches with a complete clearing of the markets.

Any violation of equilibrium proportions will cause a deviation from equilibrium prices; the correspondence between production and consumption, between supply and demand of various branches will be violated; there will be the deficiency and surpluses. The interbranch structure and the system of relative prices will change. The integrity of the economy will be violated, for the reflection between the whole and its parts will disappear. Iterations between relative prices and interbranch structure occur until a new equilibrium is established between production and consumption. The connection between production and consumption "is realized in the form of that reflection through which the whole mediates its parts. And the mediation here has a complete character - a single process of production/consumption has all the parts necessary for it, is closed, and therefore optimal in a broad sense. Within the framework of this abstract moment, which is supposed to be absolute, the law of symmetry is fulfilled: there is produced that and only that which is consumed, and there is consumed only what is produced." (Yatskevich, 1990, 83)[12]. Theoretically, this mechanism ensures the stability of system, although in practice there is only a striving for equilibrium, but complete equilibrium is not achieved due to the destabilizing effects of the external (natural and social) environment.

The economy appears as a system consisting of a set of branches. Each of them consumes commodities produced by other branches and produces commodities consumed by other branches. Commodities are produced by commodities. To simplify the analysis, suppose that the economy consists of only three branches A, B, C.

The Table1 shows the matrix of interbranch flows in natural form. The rows of the matrix show the consumption of products of this branch by other branches, and the columns show the consumption of products of other branches by this branch. On the basis of this matrix of flows in natural form it is possible to obtain two matrices - a matrix of relative prices and a matrix of transformation coefficients of goods. In turn, the second matrix consists of the ***technological coefficients*** $\bar{K}_{mn}$ (for branches of production sector) and ***consumer coefficients*** K_{mn} (for branches of consumption sector). Both these matrices of coefficients are uniquely related, because they are derived from the same matrix.

Tables 2 and 3 show the matrices of transformation coefficients and of relative prices. In Table 3 column Pa shows the products' relative prices of branches A, B and C, expressed by the units of goods of branch A. Accordingly, in the columns Pb and Pc the relative prices of the same goods are expressed by the units of goods of branches B and C. The Tables 4, 5 and 6 show the value matrixes in which the worth of commodity flows is expressed in different commodity money (Pa, Pb, and Pc). The rows of these matrixes show the distribution of products produced by the branches, and the columns - the consumption by them of products of other branches. It is implied that, due to competition, the value of goods produced by branches is equal to the value of goods consumed by them. Accordingly, at the branch level, demand is equal to supply, and for the economy as a whole, aggregate demand is equal to aggregate supply. Whichever product performs the function of a monetary unit (Pa, Pb or Pc), in all cases, the interbranch structure remains unchanged. Consequently, regardless of the selected monetary unit, there is a one-to-one accordance between the interbranch structure and the relative price system.

	A	B	C	
A	x_{11}	x_{12}	x_{13}	$= X_1$
B	x_{21}	x_{22}	x_{23}	$= X_2$
C	x_{31}	x_{32}	x_{33}	$= X_3$

Table 1.The matrix of natural flows

	A	B	C
A	$k_{11}=\frac{x_{11}}{X_1}$	$k_{12}=\frac{x_{12}}{x_2}$	$k_{13}=\frac{x_{13}}{X_3}$
B	$k_{21}=\frac{x_{21}}{x_1}$	$k_{22}=\frac{x_{22}}{x_2}$	$k_{23}=\frac{x_{23}}{X_3}$
C	$k_{31}=\frac{x_{31}}{x_1}$	$k_{32}=\frac{x_{32}}{x_2}$	$k_{33}=\frac{x_{33}}{X_3}$

Table 2. The matrix of transformation coefficients

	Pa	Pb	Pc
A	Paa = 1	Pab = $\frac{x_{21}}{x_{12}}$	Pas = $\frac{x_{31}}{x_{13}}$
B	Pba = $\frac{x_{12}}{x_{21}}$	Pbb = 1	Pbc = $\frac{x_{32}}{x_{23}}$
C	Pca = $\frac{x_{13}}{x_{31}}$	Pcb = $\frac{x_{23}}{x_{32}}$	Pcc = 1

Table 3. The matrix of relative prices

	A	B	C	
A	$x_{11}P_{aa}$	$x_{12}P_{aa}$	$x_{13}P_{aa}$	= Aa
B	$x_{21}P_{ba}$	$x_{22}P_{ba}$	$x_{23}P_{ba}$	= Ba
C	$x_{31}P_{ca}$	$x_{32}P_{ca}$	$x_{33}P_{ca}$	= Ca
	= Aa	= Ba	= Ca	=Ma

Table 4. The matrix of value flows, in prices Pa.

	A	B	C	
A	$x_{11}P_{ab}$	$x_{12}P_{ab}$	$x_{13}P_{ab}$	= Ab
B	$x_{21}P_{bb}$	$x_{22}P_{bb}$	$x_{23}P_{bb}$	= Bb
C	$x_{31}P_{cb}$	$x_{32}P_{cb}$	$x_{33}P_{cb}$	= Cb
	= Ab	= Bb	= Cb	=Mb

Table 5. The matrix of value flows, in prices Pb.

	A	B	C	
A	$x_{11}P_{ac}$	$x_{12}P_{ac}$	$x_{13}P_{ac}$	= Ac
B	$x_{21}P_{bc}$	$x_{22}P_{bc}$	$x_{23}P_{bc}$	= Bc
C	$x_{31}P_{cc}$	$x_{32}P_{cc}$	$x_{33}P_{cc}$	= Cc
	= Ac	= Bc	= Cc	=Mc

Table 6. The matrix of value flows, in prices Pc.

As follows from these matrices, in a state of equilibrium, an increase of production in any one branch is impossible without a reduction of production in some other branch. Any change leads to an imbalance of the system. In conditions when all branches produce goods for each other, the interaction between branches takes the form of commodity exchange. But the branch can sell only what it produces itself, and - buy only what other branches produce. In conditions of equilibrium, each branch produces goods exactly in the volume that fully satisfies the solvent needs of all other branches. And since the solvency of the needs of each branch is determined by the very volume of its production, it is clear that in conditions of equilibrium, with the given system of social needs, there is a single system of exchange ratios that provides a complete clearing of all markets. From this it follows naturally that in the presence of competition there is a unique equilibrium of system. Further it will be shown that this equilibrium is stable, because its

violation gives rise to economic forces that restore equilibrium. In this case, the equilibrium state corresponds to a single system of relative prices and an infinite set of absolute prices, in which they can be expressed. In the final analysis, it all comes down to the fact that each branch pays for consumed goods by produced goods. But supply and demand only contribute to matching the rhythms of production and consumption[13].

In the given matrices, M shows the amount of commodity money in circulation necessary for the normal functioning of the economy for a certain period of time, at a velocity of circulation of money equal to one. But theoretically, the actual amount of money in circulation and the speed of circulation affect only the level of absolute prices, but not relative prices and, therefore, do not affect the interbranch structure of economy. Depending on what kind of goods will be accepted as a unit of value, the absolute prices will be different, but the relative prices will remain unchanged, since the interbranch structure remains unchanged. Therefore, for the normal functioning of system, it does not matter which commodity performs the function of commodity money, or how much money is in circulation, nor even whether money is commodity, paper bills or numbers in computer memory. The main condition of equilibrium and optimal functioning of economy is the "iron law" of equilibrium - each sector must produce in accordance with the solvent needs of all other branches. It means that the value of produced and consumed goods must be equal in each branch and in the economy as a whole. Under existing restrictions (available resources, technologies and needs), the only interbranch structure and the only system of optimal relative prices correspond to such conditions. Such prices are system magnitudes; each price is a function of all other prices. This price system is a ***mathematical group***.

From the matrix of value flows it is not clear whether payments are made directly or in the form of credit. Therefore, it should be noted that, unlike barter, with the advent of money, there is the possibility of a gap in time between the sale of certain goods and buying - others. At the same time, the volume of credit operations is increased. In case of violation of balance between the volume of credits issued and redeemed (in commodity and monetary forms), not only inflation or deflation occur, but the correspondence between the absolute and relative prices is violated, and distortion of equilibrium commodity flows will occur and a search for a new equilibrium in the system will begin. (See: Leiashvily, 2012, 2015a, 2017b).

In order to understand how self-regulation of a market economy takes place, it is not enough to discover the existence of a relationship between the interbranch structure, the relative price system and the system of technological and consumer coefficients. It is necessary to understand how economic forces arise, which bring the values of produced and consumed goods in line both at the branch level and in the economy as a whole and how the stability of above-mentioned relationship is ensured. What enforces economic agents to act in one way or another? And most importantly, how does the economic order in society as a whole arise from the chaos of the individual actions of independent agents acting in their own interests? In order to answer the above questions, it is necessary previously to understand what economic values are and how, by means of values, economic needs, utility and costs are interrelated.

5. Needs, utilities, costs and values

Since each commodity is exchanged for all other commodities, each commodity has as many exchange ratios, that is, relative prices, as many other commodities exist at the market. The range of exchange opportunities, or the ***exchangeability*** of each commodity, is expressed through a series of exchange ratios with all other commodities. Each commodity has its own series of indicators of exchange ratios (i.e., a series of relative prices). Consequently, there are as many series of such indicators as there are commodities. But as we saw from the above example, the equilibrium state of the economy corresponds to a single system of relative prices (i.e., indicators of exchange ratios). And although these series differ from each other, because they consist of different indicators, but the ***ratios between the indicators*** themselves ***within each series*** are the same. This points that behind the whole set of exchange ratios, that is, behind the set of relative prices of whole goods, some kind of a single substance is hidden. But what is this invisible substance, which only indirectly manifests itself in prices? This substance is a ***social economic value***.

But if economic value is the basis of market prices, it means that the root cause and basic principles of economic self-regulation should be sought in it. For without some unifying common principle, the market prices, as well as the output of branches and exchange ratios between them, cannot by themselves come to correspondence in such a way that harmony is established in the form of reflective relations of the ***whole and its parts***. "*The general problematic of value, ... is the effort to tie the surface phenomena of economic life to some inner structure or order.* ... Empirical investigation into the provisioning process is an essential, indeed a constitutive, part of economic inquiry, but it is not the only such part. Equally necessary for the existence of what we call economic thought is a level of abstract inquiry – an inquiry directed not at the "facts" of economic life but at some structure or principle "behind" the facts. ... Economics now becomes an inquiry into the systemic properties, the structural attributes, the tendencies and sometimes even the *telos* the provisioning process. Thus behind empirical investigations into allocation problems we have theoretical premises as to the "workings" of the price

mechanism; behind the functional equations of econometric models there are assumptions as to the "laws" of behavior of individuals, or perhaps even the "laws of motion" of the capitalist system: behind input-output matrices are "production functions", equally abstract representations of the idealized behavior of the industries in question.". (Heilbroner, 1989, 105-106).

Due to the economic value, all commodities are presented as products of a single system of interconnected branches producing them for each other. And their prices are presented as a single system of prices, through which the costs and results, useful ***costs*** with the ***usefulness*** of these costs are compared. In order to understand what a ***social*** economic value is, it is necessary preliminarily to understand in general what the ***subjective*** economic value is.

Subjective value is the conscious emotionally-volitional attitude of subject to the goods that he owns, to which his will extends[14]. Value is the unity of utility and costs. But in specific acts of activity, the subject, as consumer, perceives the value of resources from the side of economic utility, and as producer perceives the value of products from the side of costs. Utility is the reverse side of the need, after satisfying of which, the subject perceives the used utility as costs. For as a result of consumption of limited goods, together with the destruction of these goods, their utility is also disappears. At that, the utility of directly consumed goods disappears, as well as the utility of alternative goods. Therefore, the loss of utility of limited goods cannot be perceived except as the costs.

Thus, as a result of consumption of resources the needs are satisfied, that is, resources are converted into products, and the utilities of resources are converted into costs embodied in products. If, as a result of consumption of resources, the needs remained unsatisfied, and resources are not transformed into products, and their utilities have not turned into costs, then their utilities have turned into ***losses***.

Products produced from resources are themselves resources for production of other products[15]. But, both products and resources are commodities, therefore, commodities are produced through consumption of commodities. But since useful goods are limited, the subject seeks to produce as many useful goods as possible, and to spend as less as possible, and so, seeks to obtain maximum utility with a minimum of costs. That is, utility and costs are a specific teleological relation of the subject to objects that arise as a result of the emergence and satisfaction of his conscious needs. Utilities and costs arise as a result of projecting subjective needs on the limited goods that can satisfy, or have already satisfied, the subject's needs. Therefore, the subject ascribes utility and costs to external objects, although in fact, they, like the needs themselves, are in his consciousness, and not in objective reality. (See., Leiashvily, 2012, 2015a, 2018). Economic needs, like the "magnetic field" arising between the subject and the objects, which are within the limits of influence of his will, generate positive and negative values (utilities and costs) as attractive and repulsive forces, which organize his actions in an orderly system of expedient actions and give them a rational meaning[16].

Economic needs are paid needs. If the satisfaction of needs cannot be "paid" by the appropriate resources, then these are only potential but not actual needs, which give rise to economic incentives and drive the entire economy. Potential needs are transformed into real ones only when resources are available to meet them. And since the product is a satisfied need, and, moreover, the products are obviously produced as resources for potential needs, it turns out that the satisfaction of some needs generates new needs. For potential needs are transformed into real ones and, thereby, revive real incentives for continuing economic activity. (See., Leiashvily, 2011, 2012, 2015a, 2017a.)

If the exchange took place, this means that for each subject of this transaction, the subjective utility of purchased good is greater than the subjective costs (i.e. sacrificed utilities) of production of sold good. That's why he made a choice and decided on an exchange. Consequently, exchanged goods are not equal as subjective values. But from the point of view of society, as a collective actor, both sides of transaction are equal representatives of the same society. Therefore, although in each exchange act, the exchanged goods are not equal as subjective, individual values, but they are equal as social values[17].

In a market economy, commodities are produced by commodities, respectively, the creation of any values is impossible without the destruction of other ones. The created and consumed values in each separate act, as well as the values of the final products and primary resources in the economy as a whole, are opposite as positive and negative values and mutually stipulate each other. This means that the total value of the final products and the total value of primary resources in the economy can be neither more nor less relative to each other. They can only be equal in magnitude and opposite in sign. Together they form the whole world of economic values of society, within which the values of specific goods differ in size. Some values are greater, others – less. But the sum of all values of a society can neither increase nor decrease; in economics, the concept of the total value of all goods is meaningless[18].

6. Social economic values

In conditions when private producers are linked to each other in a single social organism only through a market exchange of goods, the exchange itself must include a method of balancing of social utility of goods with social costs of their production. If in the process of exchange of goods there are market forces that bring the

social costs of production of goods with their social utility in line, and if incentives are created to ensure the equal utility of public costs, then this ensures that the structures of social production and consumption correspond to the structure of solvent needs.

The magnitude of ***need*** and ***utility*** of purchased goods is measured by the ***costs*** that the subject sacrifices to satisfy this need and purchase these goods and, therefore, by the production costs of the goods sold. Acceptable for him exchange ratios are determined by comparing the costs of production of sold goods with the utility of purchased goods. In this case, the variant that is the worst for one side is the best possible one for the other. The actual proportions of exchange are the result of a compromise between the parties within the specified limits.

Given that both exchanging parties represent the same aggregate social production and social needs on the market, we get the following. The social utility of commodity A is measured by the social costs of production of commodity B, and the social utility of B - by the social costs of production of A. For the social utility of any commodity is measured by the quantity of social resources and, accordingly, of their social utility, which society, in the person of this or that buyer, can allocate for the purchase of this product. It does not matter in what form these resources are allocated by society - in the form of specific goods or in the form of money. (Behind the money are the same goods). The main thing is that the society, in the person of this or that agent, considers it expedient to realize the costs for acquiring this useful commodity and to pay for the expenditure of limited useful resources for their production, by other useful resources, which are spent for production of the goods exchanged for it. It turns out that in the same exchange act takes place the comparison of goods' social costs of production with the social utility of the same goods. For the utility of this good is measured by the costs of the opposite one. Therefore, when goods commensurate with each other as costs, they also commensurate their costs with their own utility. And so does each good for its part.

All private agents are both sellers and buyers. Agents bring to the market a part of social production (demanding in return the equivalent part of another social product), as well a part of social needs (offering in return the public products, which they produce). Each of the parties tends to minimize the costs and maximize the acquired utility. But producers and consumers, as well as sellers and buyers, are in the reflective relationships. Therefore, what one side considers an increase in utility, for another means an increase of costs, and a decrease of costs for the first party, means a decrease of utility for another. At the same time, in a market economy, each agent can potentially enter into relationship with all others, and each good can potentially be exchanged with all other goods. Competition allows everyone to look for more compliant partners and to defend own interests. But the transaction itself can be accomplished only with the consent of both parties. And this forces everyone to be compliant too. The mutual interweaving of oppositely directed interests of all participants of market creates a general tendency to ***"equalutility of costs"*** across the whole economy, when on each unit of cost comes an equal size of utility. This ensures the conditions for general economic equilibrium.

It is clear that in conditions of imbalance between the social needs and production there emerges a discrepancy. If goods are produced in excess, then for each unit of costs embodied in product comes a less social utility than in an average across the economy. Otherwise, per unit of utility come the greater costs than in the state of equilibrium of economic system. The opposite happens in the case of deficit production - per unit of costs comes greater utility than in the state of equilibrium. In the first case, production of goods is unprofitable for producers, and their consumption is profitable for consumers, but in the second case - on the contrary. The desire to redistribute resources, to withdraw them from surplus production and invest into deficient one, in the long run, creates the tendency to establish the ***equalutility of costs***. Violation of economic equilibrium exacerbates the contradiction between utility and costs within the economic value, and generates market forces directed to the recovery of equilibrium. That is, the system is stable and self-regulating.

To satisfy any need, society can allocate a certain amount of resources, which, ultimately, must be paid for by other, equally valuable resources, embodied in other goods. This is an inevitable consequence of the division of labor. But if goods are actually produced more or less than is necessary for satisfaction of society's solvent needs, then there arises a discrepancy between the amount of costs embodied in goods themselves and the amount of costs embodied in other goods by which the first goods will be paid. Naturally, in conditions of free competition, individual producers will correct their activities by expanding or reducing production so as not to remain at loss. In general, the exchange of goods based on social values is oriented to establish equilibrium in the economy, in which social costs and public utilities balance each other. This ***equalutility of costs*** is, ultimately, a condition for the proportionality of social production. (See, Leiashvily, 2011, 2012, 2015a, 2017a, 2018)

7. Market pricing

In a market economy, goods are produced by goods. Accordingly, the prices of goods produced are based on the prices of goods consumed. Ultimately, if we ignore intermediate production, the consumption of primary resources is necessary for the production of final products, and the consumption of final products is necessary for the reproduction of primary resources. Consequently, the prices of the final products depend on the prices of primary resources, and the prices of primary resources on the

prices of final products. That is, it takes place: p = F (p, v); v = G (v, p); where: p - prices of final products; v - prices of primary resources. And this means that pricing is a recursive process in which ***"eigen-values"*** arise. H. von Förster, the founder of 2nd-order cybernetics, in *Understanding Understanding* (2003) gives similar formulas $x' = D(x, u)$, and $u' = S(u, x)$, in which the variables x, u are represented as functions of themselves. You can also take into account the passage of time by introducing the "time" parameter in the form of an increasing sequence of time units: t - now, $t + 1$ - is the following unit of time: $x_{t+1} = D(x_t, u)$, and $u_{t+1} = S(u_t, x)$. He writes further:

> *"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." (Foerster, 2003, 315)*

But how exactly are these general provisions of the second order cybernetics implemented in the economic sphere? How do prices emerge from prices? How does the economy exhibit circular causality between the price system and the sectoral structure? Between micro and macro processes? How does an economic order emerge from the chaos of uncontrolled economic action?

For the sake of their interests, agents produce goods for each other and then exchange them. In the process of exchange, they are also guided only by their own interests. At the same time, the subjective values of the parties, on the basis of which they make their decisions, are incommensurable. But no matter how differ subjective values, on the basis of which each of them independently makes their choice, in any case, if the exchange has taken place, it always implies one or another exchange ratio.

During a certain period of time, the exchange of the same two goods occurs in a variety of other transactions between different individuals. In each separate transaction, different exchange ratios are formed. Accordingly, the ***individual prices*** of these goods differ from each other, for the subjective values of different individuals differ from each other. But the ***market prices*** of these goods are weighted averages from the entire set of individual prices, on which the transactions were made for the specified period of time[19]. Due to this, social economic values, as values of a collective subject that manifest themselves in market prices, synthesize in themselves the subjective values of individuals, based on which individual prices and, ultimately, market prices themselves were formed. And just as the subjective values of goods exist only in the consciousness of individuals, and not in the goods themselves, so social values exist only in social consciousness, in intersubjective space, that is, in so-called "second-order reality".

Market prices, which are weighted averages from individual prices, serve as reference points for agents, when making individual decisions, for evaluating and searching for opportunities to find more profitable deal options. On the one hand, the market price protects agents from making unprofitable transaction. On the other hand, since these very searches for more profitable transactions are associated with transaction costs, then on the basis of market prices, agents individually resolve the expediency of further searching for more profitable transactions.

However, in addition to the market prices, in each given transaction the individual takes into account other conditions in which he has to function. In addition to general economic conditions (expansion or recession, inflation, unemployment, public moods of optimism or pessimism, etc.), individuals take into account conditions unique for each of them. Each of them has different preferences, rational expectations, production opportunities, comparative advantages. Each of them reacts in a specific way on the changes of same general economic conditions, some are more rational, others are less, and some are entirely irrational. All these individual characteristics are specifically reflected in the exchange ratio of each individual transaction. Therefore, in each specific transaction, individual prices deviate to a certain extent from average market prices. Accordingly, the set of individual prices, which will be formed as a result of individual deviations from existing market prices, will in general fully reflect all changes in the needs and production capacities of society.

There is an inverse relationship between individual and market prices. Individual prices deviate from market prices, which are their reference points, and market prices themselves are formed as average magnitude from the entire set of individual prices. Therefore, the set of individual prices, which is formed by deviating from current market prices, serves as the basis for the formation of new market prices, which, in turn, will become new reference points for the formation of a new set of individual prices, etc. without end. Individual and market prices are formed in an endless process of circular causality. They infinitely change each other. At the same time, depending on how quickly market information about prices spreads generally, the rate of response of individual prices to changes in market prices and the rate of reaction of market prices to changes in individual prices depend.

In this case, individual deviations from market prices occur consciously, but the formation of market prices, as average magnitudes, occurs spontaneously. For, although the deviation of individual prices from market prices in each transaction occurs consciously, but the very ***set*** of individual prices (the ***number*** of transactions and the ***bigness*** of individual prices in each of them), on the basis of which average market prices are formed, is formed spontaneously.

Market prices affect the adoption of agents' individual economic decisions. Therefore, the change in market prices leads to a change in individual production and consumption, individual demand and supply, the number and volume of individual transactions and individual prices of goods in each of them. And as a result of the changes taking place at the individual level, the market prices, production and consumption of branches and, ultimately, the interbranch structure of the economy and economic activity in general, will change at a social level. And that this circular process of mutual formation of parameters on micro- and macro-levels occurs simultaneously, in a parallel mode. The existence of a "feedback" between micro- and macroeconomic processes is a necessary condition for self-organization of a decentralized economic system. In his book *Erfolgsgeheimnisse der Natur* one of the founders of synegetics H. Haken wrote:

> *"What until now seemed mysterious, inexplicable, or even paradoxical, suddenly becomes completely clear. We find that the collective behavior of many separate individuals (be it atoms, molecules, cells, animals or people) and, ultimately, their own destiny is determined by them themselves in the course of their interaction with each other: through competition, on the one hand, and cooperation on the other. .... In this sense, synergetics can be regarded as the science of collective behavior, organized and self-organized, and this behavior is subject to general laws. When a science declares the universality of its laws, it immediately causes very important consequences. Synergetics is based on very different disciplines, including not only physics, chemistry and biology, but also sociology and economics ... " (Haken, 2003, 24-25) "When we continue to talk about collective behavior, we will mean by this a behavior in which people act as if they conspired with each other." (Ibid. 165) "Here we are again encountered with a peculiar relationship between separate individuals and an ordered structure. Structure subjugates individuals; however, the opposite is also true: it is individuals who support the existence of structure." (Ibid. 189)*

Another property of this process is that the individual parameters of economic activity of each agent are formed on the basis of consciously made decisions, and general economic parameters are spontaneous. For, in the absence of external regulation, from the chaos of uncoordinated actions of a multiplicity of independent agents, the very ***set*** of different individual parameters are spontaneously formed, from which, in turn, the system's uniform parameters are formed. This is an essential factor determining the elements of spontaneity and uncertainty in a self-regulating decentralized economy, in which the macroeconomic order is born out of microeconomic chaos.

8. Criteria for optimality

In order to obtain the most useful products by available resources, in entire economy resources should be optimally distributed so that for each unit of costs (sacrificed utility) of resources an equal utility of products come. But in fact, there is always a deviation from the optimal allocation of resources. In some goods economic utility per unit of cost is greater than the average, in other cases - on the contrary. In one case, we get a ***deficit***, in the other we get ***surplus***. This means that a certain part of resources is spent for production of economically less useful goods (surpluses), as a result of which they are no longer sufficient to produce more useful goods (scarce goods). Thus, overproduction in some branches causes underproduction - in others.

Deficit and surplus are measured by the degree of deviation of the available amount of goods from the optimal one. And the optimal amount is the one at which the equal utility of costs is achieved. The condition of equilibrium and optimality is the ***equalutility of costs*** in all branches, which indicates an accordance of production and consumption structures to the structure of society's solvent needs.

But the ***equalutility of costs*** is only a ***global criterion*** of optimality, which contributes to the optimal distribution of available resources among branches. However, for optimal use of resources their optimal distribution is not enough. After all, the ***equalutility of costs*** does not exclude the possibility of equally low effectiveness of cost in all branches. Therefore, the economical using of resources and using of efficient technologies are also necessary. For obtaining of products' maximum total utility with available resources implies that this utility is received by the minimal cost. One is impossible without the other. Therefore, when making certain economic decisions, the agent is guided, also, by the ***local criterion*** of optimality, which implies not the ***equalutility of costs***, but, on the contrary, the maximum utility at minimum costs. In accordance with local criterion of optimality, the subject not only strives to obtain a ***maximum utility per unit of costs*** and, thus, produce the most deficient products with available resources. He, also, seeks to implement a ***minimum costs per unit of utility*** and, therefore, use efficient technologies, save resources and eliminate losses in production processes.

At the macro level, the global criterion of optimality in monetary form is manifested as the equality of nominal value of produced and consumed goods, also, of demand and supply, in

each separate branch and in the whole economy. A local criterion of optimality in monetary form is manifested in maximization of incomes and minimization of expenditures. Accordingly, in the first case, optimization is reduced to the search for an ***essential relation*** between the necessary parts of the whole and to the process of formation of integrity. And in the second case, optimization is reduced to the finding of extremum; of maximum or minimum value of extremized function.

> *"... the very concept of "optimal" is divided into two: "optimal in a narrow sense" and "optimal in a broad sense". (Yatskevich, 1990, 27). The optimal in the narrow sense implies an extremum and a movement towards it. . . . Having determined the feasible set of solutions, we thereby define, fix the quality. The optimization process here does not take us beyond this quality. . . . Optimal in the broad sense means the necessary belonging (inherency) of some element to the system. Without it, the latter cannot be wholeness. Each of its elements assumes all the others, and each element is assumed by all others. Therefore, optimization in the broad sense is the search for not just some element-solution, but the search for integrity, that is, quality. .... Such optimization is essentially based on a set of system-forming relations. The presence of any extremum here is of secondary importance and does not determine anything by itself. "(Ibid, 30).*

But the incomes of producers (entrepreneurs in production sector) are the expenditures of consumers (the owners of production factors in consumption sector), and vice versa, the expenditures of the former are the incomes of the latter, and the difference between incomes and expenditures takes the form of profit in one case, and the form of savings - in the other. In the process of exchanging, economic agents remunerate to each other profit and savings, depending on whether they buy final products or primary resources. For profit and savings are components of price, respectively, of final product and of primary resource. Therefore, while in production process, actors create surplus value in the form of profit (in production sector) or in the form of savings (in consumption sector), but in the process of exchanging they pay to each other their profits and savings. Ultimately, in conditions of equilibrium, the profits of some are paid for the savings of others, and vice versa. Therefore, as a result of exchange, aggregate profits and aggregate savings mutually balance each other[20].

Local and global criteria of optimality only in unity form a general criterion of optimality, which is the Pareto criterion, which provides a maximum of aggregate utility with a minimum of total costs already at the level of the entire system. At that, this state of the economy is achieved just in conditions of equality of total utility and total costs. And only in this case, all branches begin to produce goods in accordance with the solvent needs of all other branches. As a result of this, such an optimal system of exchange ratios or equilibrium relative prices is formed that no deficits or surpluses arise on the market.

Conclusion

The causes of the mainstream crisis lie deeply at the level of methodology. In the framework of the methodology used by it, it is impossible to bridge the gap between economic theory and reality, or to resolve logical contradictions within the neoclassical theory itself. Due to incorrect methodology, the mainstream cannot understand economic processes in their unity and interdependence. Overcoming the current crisis of economic science needs new research methods. At that, present-day science offers new ideas regarding research methods for complex, nonlinear, dynamic systems, which is also the economy.

The problem that A. Smith expressed in the metaphor of the "invisible hand", i.e. how the economic order is born out of the chaos of egoistic interests and actions of many independent actors, synergetics studies in a universal form, in the context of all phenomena of animate and inanimate Nature. For it turned out that this problem is not only in economic science. This is a common problem of the entire Universum. Magnum Opus of I. Prigogine, one of the founders of synergetics, is called *Order from chaos*[21]. Synergetics studies the processes of self-organization in complex, non-linear, dynamic systems of various nature, including social systems. But in neoclassical theory, economics is not represented as a complex nonlinear dynamic system. Moreover, this theory cannot explain the functioning of the economy as a single whole. It sees only the differences between production and consumption, between demand and supply, product and resource, utility and costs, etc., but does not see the deep immanent connection and identity between these opposite categories, which can be found only at the level of essence. Therefore, their theory consists of artificially joined fragments, beyond which it is impossible to see the integrity, harmony, and symmetry that are inherent in a competitive market system, and without which it is impossible to take the birth of order out of the chaos of actions of economic actors.

Dialectical contradictions between production and consumption, supply and demand, utility and costs, etc. exist really and it's impossible to "get rid" of them. If they are not "noticed", then they will not cease to exist, but they will necessarily "stick their heads out" in the form of subjective (logical) contradictions either in the theory itself or between theories and facts. This is confirmed by the abundance of such contradictions in neoclassical theory. A theory cannot adequately reflect economic reality if it does not reflect the contradictions objectively existing in it. For example, according to neoclassical theory, market prices are formed as a

result of the equation of market supply and demand. But market demand and market supply are formed as a result of aggregation of individual demands and supplies, which, in turn, among other factors, also depends on market prices themselves. According to formal logic, a logically "vicious" circle clearly appears here. For, in the final analysis, the formation of market prices depends on the market prices themselves. This criticism to the address of the neoclassicists has repeatedly sounded by their opponents. But this "vicious circle" arises only because of the depravity of their very logic, based on "methodological individualism." This "vicious circle" is only unperceived by them and unexpected for them a form of manifestation of really existing feedbacks between processes at the micro- and macro-levels.

According to dialectics, the whole world is one whole, and separate phenomena in it make sense only as part of the whole. Accordingly, phenomena can only be understood in the context of the whole of which they are a part. Therefore, Hegel writes: "only the whole makes sense." This is the principle of holism, according to which the knowledge of the whole must precede the knowledge of its parts. Starting from the 17th century, thanks to the intensive development of natural science, mechanistic and reductionist ideas began to dominate in Western science. The scientific method is still dominated by the analytical method, which ignores the appearance of emergent properties in higher-level systems. According to this method, they try to know the properties of the system as a whole through the knowledge of parts, by decomposing it into parts. However, since the second half of the 20th century, along with the development of the general theory of systems, synergetics, and the theory of complex systems, interest in the ideas of holism has been growing. In this regard, there has been an increase in interest in new qualities arising in systems that are not reducible to the sum of the qualities of system elements.

The decisive role of the whole in relation to its parts is the point of view, which adheres to the dialectical method of Hegel and Marx. And the opinion that there are supposedly independent parts that are connected and make up the whole is essentially false. Therefore, it is methodologically incorrect to investigate first the individual parts of the object under study, and then hope that by mechanically combining the results of the study we can get a general theory. As Hegel writes: "The individual members of the body are what they are only by means of their unity and in relation to it. Thus, for example, a hand that is severed from the body,-is a hand only in name, but not in reality *[der Sache nach],* as *Aristotle* already noted.". (Hegel, 2010b, p.288.) That is why it turns out that with an isolated study of parts separately from the whole, the interconnections between the parts of a single economic organism are broken. In such a study of individual parts, from the very beginning, the very properties by which they are part of a particular whole and perform their strictly defined function within the whole remain out of focus. That is why reductionism, and in particular the «methodological individualism» of neoclassics, make it impossible to adequately understand economic reality[22].

According to this model, like the model of Piero Sraffa, the economy is a circular process of "production of commodities by means of commodities". In this sense, like P. Sraffa's model, this model is opposed to the neoclassical model, according to which the economy is "a one-way avenue that leads from 'Factors of production' to 'Consumption goods' " (Sraffa)[23], in which the problem of how primary resources are reproduced is not considered. However, P. Sraffa considers the production of production factors by final products in the physical sense. This kind of "physicalism" of his theory gave rise to many unsolved problems from a purely theoretical point of view, including the problem of the relationship between production and distribution (not to mention unrealistic assumptions and a huge separation from economic realities).

In the proposed concept, the services of production factors are clearly distinguished from the right to use them. Producers do not buy production factors, and not their services, but the right to temporary use of these services. Accordingly, the costs of reproduction of primary resources are reduced to the consumption of final products not for the reproduction of factors themselves, but for the reproduction of the living conditions of their owners who sell these rights. In other words, we are talking about an equivalent market exchange of final products and the right to use the services of production factors based on economic values. Thanks to this interpretation, we get a clear idea regarding the imputation of national income to various factors of production, depending on the services rendered by them in its creation. And the distribution of national income between private subjects depends, in turn, on the distribution of the factors of production themselves between individual owners.

According to the proposed concept, what at the micro-economic level is a network of chaotic "weak links" between millions of independent actions, at the macro level, as a result of the aggregation of these actions in the form of branches, and, in the form of flows of goods and money, takes the form of rational interaction of separate parts of the economy, which constitute a single wholeness. That is, the relation of the ***whole and its parts*** arises as an emergent property of the economy as a complex nonlinear dynamic system of economic actions. And this property is manifested in the fact that each branch produces products in accordance with the solvent needs of all other branches. That is, the principle operates - "one for all and all for one."

These properties were studied in the Theory of Chaos, 2nd order cybernetics, and the theory of neural networks. However, all these theories, which should form the methodological basis for economic research, can be applied and become relevant for research only after the economic system is presented as integrity,

as a single complex, nonlinear, dynamic system of economic actions, as a unity of micro- and macro - economic processes. And this is possible only on the basis of dialectical analysis.

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Footnotes

1. For more details see: Leiashvily, 2011, 2012, 2015a, 2017a, 2018.
2. The branch of production sector is a set of firms that produce homogeneous products, and the branch of consumption sector is a set of households that reproduce homogeneous primary resources. In this article, under the branch of consumer sector, we mean the totality of households that reproduce and supply to production sector the right to use specific services of factors of production.
3. To avoid double counting, we do not count the intermediate product separately.
4. Although as objects, of course, they are reproduced by nature.
5. Buying and selling of commodities is the exchange of property rights. Since services are consumed (and destroyed) in the very process of their production, and have a number of other features, owners sell to entrepreneurs "live" services in the form of the right to use the services of production factors.
6. Leon Walras attached great importance to distinguishing factors of production and their services. He believed that without this it is impossible to understand either pricing, capital market, or the problem of interest. (See, Walras, 2000, 152). Marx's approach to the question of the demarcation of the labor force as a production factor and labor as its services is similar. "He must constantly treat his labour-power as his

own property, his own commodity, and he can do this only by placing it at the disposal of the buyer, i.e. handing it over to the buyer for him to consume, for a definite period of time, temporarily. In this way he manages both to alienate *[veriiussern]* his labour power and to avoid renouncing his rights of ownership over it." (Marx, 1982, 271).

7. Since only living persons can possess rights and be proprietors.
8. "Whatever network is considered (egocentric or sociocentric), the central point always remains the structure of network relations - a model of connections, presented in the form of patterns of interaction of social actors. ... The social actors of the network can be either individual members of society or collective social associations, which allows researchers to consider a wide range of structures - from the micro to the macro level. ... The network structure includes not only social actors, the relationships between them, but also the flows of resources that network members exchange among themselves. ... Today, network theory, which is a complex, generalized system of views on social life and human experience, is one of the most influential areas in modern sociological thought. " (Knyazeva, 2006, 82-88.)
9. "The whole and the parts *thus reciprocally* condition each other; … But the whole, through the condition of the parts, itself immediately entails that it, too, is only in so far as it has the parts for presupposition." (Hegel, 2010a, 452). "The whole has all features of absolute - it is absolutely whole, because it contains all that and only that which is necessary, and by this exhaustively determines itself." (Yatskevich, 1990, 66-67).
10. It is noted that one and the same object may have a different set of models, but the most adequate from them will be the one that reflects the basis of integrity of phenomenon under consideration as the leading moment. The concept of "whole" has a direct relation to the problem of optimal choice. ... In this sense, to choose the optimal one - means to provide, create, construct the wholeness, and perform creative function." (Yatskevich, 1990, 68)
11. Of course, typical barter problems may arise when branch ***A*** needs products of branch **B**, but branch **B** does not need the products of branch **A**, but needs products of the third branch **C**, which, in its turn, does not need products of branch **B**, but needs products of branch **A**, etc. But this problem is easily solvable and does not change the essence of the matter. The connection between them in all cases is reduced to the form **xA = yB**.
12. "Suppose that all manufactured products, bypassing any control, leave the producer and its further "fate" is not known. Somehow it is sold out, somewhere "settles down", creating a semblance of consumption, but no information about this in any form is received. That is, the production does not know anything about consumption - there is no corresponding feedback. Then there is no consumer impact on production. Under this condition, a single process of production-consumption breaks up into components, its integrity is violated. Its two sides exist as if separately, the relationship between them is characterized by absolute alienation. Then you can produce any product, including not having a consumer value, and you may do nothing at all. . . . All these provisions are in harmony with the widely known fact in cybernetics: if there is no closedness, then the dynamic process loses stability. The case considered is extreme, but it convincingly shows that the weakening of reflection reduces the efficiency of the entire production. If there is no closedness, then there is no certainty, and so there is no optimality either." (Yatskevich, 1990, 83-84)
13. For these rhythms do not coincide in time. For example, a wheat crop is harvested once or twice a year, but the bread is consumed daily. Or vice versa, there are goods consumption of which is seasonal, but they are produced throughout the year, etc. With the help of supply and demand is regulated what portions to bring to the market goods for sale in accordance with the demand for them. But if we take a long enough period of time, then the supply and demand for this period are more or less in line with production and consumption for the same period. And the periodically arising discrepancy between them in the long-run period is precisely the cause of the economic crises that restore the broken correspondence. (See. Leiashvily, 2011, 2012, 2018.).
14. The subject knows that the goods, which are in possession of other owners, have subjective values to their owners, and have a social value for society as a whole. But other people's goods, which are not covered by the will of the given subject, do not have real subjective values for him and can't create real incentives for his economic activity.
15. ".... the product of the purposive activity is nothing but an object determined by a purpose that is external to it; thus it is the same as what the means is. In such a product itself, therefore, only a means has been derived, not a realized purpose; ... It is therefore entirely a matter of indifference whether we consider an object determined by external purpose as realized purpose or only as means; what we have is not an objective determination but a relative one, external to the object itself. All objects in which an external purpose is realized equally are, therefore, only a means of purpose." (Hegel, 2010a, 666).
16. "The value problematic concerns the nature of this "deep structure" within economic life and the manner in which it influences the surface phenomena of production and distribution. It must therefore be apparent why the search for such a structure, the explanation of its configuration, and its connection with the world of appearances is a perennial question of elemental importance. Value theory (the "theory" is a redundancy in that the task is inherently theoretical) is the name we attach to the search for processes or structures that impart orderly configurations to the empirical world, akin to

the arcs created in iron filings under the influence of magnet." (Heilbroner, 1989, 106-107). ". . . the mechanisms only serve as the means by which the empirical world is guided toward a certain configuration. The search for value is an inquiry into the rationale and characteristics of that configuration. As Adolph Lowe puts it: "Suppose that a universal amnesia were to out the knowledge of all present prices, would there be a rule for reestablishing them?" . . . Some conception of value – some idea of a structure or order behind the flux of activity – is therefore integral to economic thought, for economic thought is an effort to explain the nature of the phenomenal world. What is surprising is that, after so many decades of discussion and debate, the nature of that order-bestowing substance or process remains unresolved." (Ibid, 107-108).

17. From the individual's point of view the subjective value increment in exchange is perceived as payment for entrepreneurial risk or for abstinence (depending on whether his goods are the final product or primary resource). But what is perceived as value increment from the subject's point of view, from society's point of view it is mutual compensation of the exchanging parties for entrepreneurial risk and abstinence, the monetary expression of which are, respectively, the profits and savings that are included in composition of prices of exchanged goods. (See., Леиашвили, 2015a; Leiashvily, 2011, 2012, 2015a, 2017a, 2018).
18. In the context of the foregoing, the opinion of J. Schumpeter concerning the exchange value of all taken together things is of interest, which is evident from his interpretation of Say's law. He's writing: "Strictly speaking, there is no more sense in speaking of an economic system's total or aggregate demand and supply and, incidentally, of overproduction than there is in speaking of the exchange value of all vendible things taken together or of the weight of the solar system taken as a whole.... Finally, the law, at least by implication, amounts to a recognition of the general interdependence of economic quantities and of the equilibrating mechanism by which they determine one another, and therefore has a place — as have other contributions of Say's — in the history of the emergence of the concept of general equilibrium." (Schumpeter, 2006, 587.)
19. It's about the actual current market prices, not about equilibrium prices. Equilibrium prices are the ideal prices in the case of an optimal interbranch structure in which everything that is produced is consumed and everything that is consumed is produced. But the actual prices and the interbranch structure always strive to optimal ones, but they never reach them because the actual prices and interbranch structure are constantly changing because of the continuing changes in technologies, needs, natural and social conditions and other perturbing influences of the external environment.
20. As long as the average rate of profit and the average rate of savings remain equal within the economy, deviations of these norms in various branches compensate each other. But if this equality is violated, then it already violates the macroeconomic balance. Profits and savings are mutually opposite values, as are the prices of products and the prices of resources. And both are the difference between the incomes and expenditures in mutually opposite sectors. Therefore, the profit of entrepreneurs should be balanced by the savings of owners. Therefore, in the economy as a whole, together with the equal utility of costs, exchange implies the equality of gross profit and gross savings. That is, in accordance with the global criterion, the equality of gross profits and gross savings is a necessary condition for the optimal state of the economy. But since profit and savings are invested in human and physical capital, the general equilibrium also implies the equality of four parameters - profit, savings, investment in human capital, and investment in physical capital. (See., Leiashvily, 2011,2012, 2015a, 2017a.)
21. "Much of this book has centered around the relation between the microscopic and the macroscopic. One of the most important problems in evolutionary theory is the eventual feedback between macroscopic structures and microscopic events: macroscopic structures emerging from microscopic events would in turn lead to a modification of the microscopic mechanisms. Curiously, at present, the better understood cases concern social situations. .... Such interrelated processes generate very complex situations, the understanding of which is needed before any kind of modelization." (Prigogine, 1984, 191)
22. "It has been observed that the same object may have a different set of models, but the most appropriate one would be one that reflects the basis of the integrity of the considered phenomenon as the leading moment." (Yatskevich, 1990, 68)
23. " It is of course in Quesnay's *Tableau Economique* that is found the original picture of the system of production and consumption as a circular process, and it stands in striking contrast to the view presented in modern theory, of a one-way avenue that leads from 'Factors of production' to 'Consumption goods'." (Sraffa, *1960, 93.)*

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