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The Relativity Theory of General Economic Equilibrium

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Abstract **Purpose.** The purpose of this paper is to propose a new approach to the understanding of self-regulation mechanism of decentralized economic system. **Design/methodology/approach.** As a result of the dialectical analysis of fundamental economic categories of market economy it appears as the form of a complex, non-linear, functionally closed and causally open system of economic actions. These systems have a number of unique properties that are well studied by second-order cybernetics. This allows in the study of economic processes the unique research and development of this science to be involved in the interdisciplinary format. **Findings.** The self-organization of a market economy is carried out through the recursive processes. Recursive processes in the economic system, as well as in other complex nonlinear dynamical systems, generate "eigenvalues" ("fixed points"). These "eigenvalues" are the equilibrium prices to which through the recursive processes tend the actual market prices, thus providing a tendency of the system to the general equilibrium. However, due to constant influence on the system of random external factors, the general equilibrium is never achieved. **Research limitations/implications.** On the base of the created model the hidden relationships among the gross profit, gross saving, gross investment and gross consumption in debt, as well as the relationships among the other economic parameters are revealed. This is important for adequate understanding of economic reproduction, tendency to general equilibrium, genesis of economic cycles, etc. **Practical implications.** The proposed understanding of self-regulation mechanism of decentralized economic system will help to improve the applied economic models and to develop the effective economic policy. **Originality/value.** The original interpretation of economic self-regulation mechanism of market economy is given. The "Symmetrical model" of general economic equilibrium, which shows how economic forces arise, where they are directed and how interact with each other, which provide the homeostasis of a decentralized economic system, is proposed. This model shows the attractor of a real disequilibrium economy.

Keywords Market economy, Dialectics, Second-order cybernetics, Economic equilibrium, Closeness, Recursive processes

It is the harmony of the diverse parts, their symmetry, their happy balance; in a word it is all that introduces order, all that gives unity, that permits us to see clearly and to comprehend at once both the ensemble and the details.

Henri Poincare

Symmetry in nature underlies one of the most fundamental concepts of beauty. It connotes balance, order, and thus, to some, a type of divine principle.

Encyclopedia Britannica

When Einstein was working on building up his theory of gravitation … [he] was guided only by the requirement that his theory should have the beauty and the elegance which one would expect to be provided by any fundamental description of nature.

Paul Dirac

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1. Introduction

The modern economy is unable to function normally without the government regulation, without development of effective economic policy. This requires the clear understanding of essence of economic processes, that is requires theoretical knowledge. But the recent worldwide crisis has shown that the economic science still lacks of sufficient knowledge for creation of adequate models, making correct economic predictions and development of effective policy recommendations.

One of the main components of current economic paradigm is the theory of general economic equilibrium and, in particular, the Arrow-Debreu's model, as a modern version of Adam Smith's "invisible hand". It has the same value in neoclassical theory, as the labor theory of value in Marx's economic doctrine. As a result of the global economic crisis of 2008-2010, the applied economic models, more or less inspired by the ideas of the Arrow-Debreu model, including DSGE model, have been completely discredited. Moreover, this crisis has revealed not only the

ineffectiveness of these models, but the deep crisis itself of neoclassical theory, on ideas of which these models are built.

In spite of the fact that more than century efforts (since Walras) of theorist economists to create an adequate mathematical model of decentralized economic system have not been yet crowned with desirable results, the idea of general equilibrium is so attractive that seemingly economists will not refuse it in the nearest future. This article presents another attempt to clarify this very important scientific problem.

Unlike the natural sciences the theories in social sciences are able to change the way of systems' functioning. An economic reality is formed by collective social actions. However, these actions depend on the knowledge obtained from the cognition of economic reality. "Social sciences like economics differ from the hard sciences in that beliefs affect reality: beliefs about how atoms behave don't affect how atoms actually behave, but beliefs about how the economic system functions affect how it actually functions." [1, p.91] It turns out that, on the one hand, the collective actions depend on the cognition and on the other hand cognition is determined by the collective actions. As long as neo-classics not aware of this circular causality, in their theory, it takes the form of a logical "vicious circle". Therefore, they can neither develop an adequate economic theory nor evolve effective policies. The above mentioned "vicious circle" is brought about by the false methodology of neoclassical theory, according to which it studies only the economic facts, phenomena, but cannot get at the essence, because it does not recognize its existence and does not own the methods of its knowledge. Thus, what happens in the economic reality at the level of empirical facts, a great deal is brought about by the very theories. Clear evidence of this is the crisis of 2008-2010.

However, only the processes occurring at the empirical level (that is, something that is studied by the neoclassical thought) depend on the actions of economic agents. But, the essence of market economy is not determined by these actions. Rather, they themselves are caused by this essence. Therefore, it is necessary to investigate the essence of economic processes. However, such investigation is possible only by the dialectical method of research, which is radically different from the methods of neoclassical economists.

In result of investigation of the essence, the market economy appears as an operationally 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.

2. Dialectics of Economic Categories

Economic functions, phenomena and categories that express them are closely interrelated and both relative and inseparable as positive and negative: consumption and production, selling and buying, supply and demand, income and spending, profit and saving, utility and costs, investment and consumption in debt, credit and debt, etc. Opposites can confront each other only because they are in relation forming a whole in which one moment is just as necessary as the other. These functions cannot exist without each other. They make a single whole, closed structure, where everything is relative, where one cannot exist without the other, as positive and negative cannot exist without each other.

It follows from the foregoing that for the analysis of market economy it should be presented in the form of an operationally closed complex system. But to identify this operational closeness, first must be identified the dialectical relationships between the fundamental economic categories, which cannot be detected by traditional methods of neoclassical theory. Dialectical analysis of these categories as a necessary precondition for building a "symmetric model" of operationally closed decentralized economic system is given below.

2.1. Production and Consumption

1. To identify the essence of market economy you must first reveal the deep inner connection, which exists between production and consumption in general, and between production and consumption sectors of economy - in particular. The process of production itself is a process of resource consumption, and consumption of recourses is production of products.

> *"Production, then, is also immediately consumption, consumption is also immediately production. Each is immediately its opposite" [2, p.717]. " ... 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. [2, p. 719 -720].*

So, it's not two different processes, but one and the same process, seen from different points of view, or two different but dialectically connected functions which performed in the process of converting resources into products.

In a market economy, where products and resources take the form of commodities, this process takes the form of transformation of some commodities into others or, if expressed in the sense of P. Sraffa, "the production of commodities by means of consumption of commodities." Due to this circumstance the production sector and consumption sector are also inseparably linked. Although they are "in the external relation to each other" (Marx), each of them by itself is a unity of production and consumption. In this sense, they are identical. But since each of them consumes what the other produces, then in this sense, they are also opposed. They are identical and opposite simultaneously and form a dialectical contradiction, just that which drives the economy.

2. The matter is that for production entrepreneurs buy from owners not the production factors (Labor, Land, Capital), but only the rights of temporary use of services of these production factors. Payments for them are wage, interest and rent. And entrepreneurs sell to them (and to each other) entrepreneurial services and make a profit. Primary economic resources for entrepreneurs are just the right of temporary use of the services of production factors, which they buy from their owners.[1] But if this is so, regardless of whether production factors themselves are reproducible or irreproducible, in all cases, the primary resources *as commodities* are *reproducible goods*. Reproduction of primary resources as commodities is reduced to reproduction of life of owners of production factors, only which have the right to sell these "rights of use." The owners sell the services of production factors and keep them (production factors) as a permanent source of incomes just because they do not sell the production factors themselves. Thus, the approach of Marx to the question of buying the right to use the labor force in the market economy should be extended to other production factors.

The difference between the reproduction of owners of labor force and of owners of other production factors is only that in the former case a labor force, as the ability to work, is reproduced too. For it is the ability of the owner. But in case of owner of other production factors, reproduction of owner does not mean the physical reproduction of the Capital or of the Earth. In this case, the property exists separately from the owner. Therefore, the reproduction of owner means the reproduction of rights, but does not mean the reproduction of those useful properties of production factors for which these rights are purchased. (It should also be noted that, of course, nothing prevents producer to buy the title of property too. But in this case he acts not as a producer but as an owner. This is just another function that can be combined with the function of producer.) This means that the reproduction of primary resources is reduced to consumption of consumer goods, i.e. of final products, needed for owners' life. [5-8]. This is the reproduction of resources not in a physical, but in economic sense. Of course, in the physical sense, the amount of reproduced resources (services of production factors) depends on the amount of production factors, but not on the amount of products consumed by its owner. But, after all, economics is interested exactly in economic sense of economic processes. Also, production of final products is of interest for economics not as a physical or technological process, but as an economic process. Namely, it is interested in production process of final products *as commodities*, which belong to their owners, have social utility, are destined for sale, etc.

3. It follows that the sphere of consumption of final products is the sphere of reproduction of primary resources and the sphere of production of final products is the sphere of consumption of primary resources. Each of these sectors produces goods that are consumed by the opposite sector. A "resource" of one side is a "product" for the other side.[2] Just because of this contradiction they become necessary for each other, becoming the necessary parts of wholeness. This wholeness, dissected inside into separate branches, just dictates the proportions of social production, consumption, distribution and exchange. This whole is a market economy "producing goods through the consumption of goods." And the relations between the production and consumption sectors, as the parts of a whole, take the form of market exchange.

2.2. Surplus Product and Surplus Resource

4. The exchange ratios (prices) in the market are set so that only part of final product is exchanged for primary resources needed to produce that product. That is, the value of resources, spent in production sector, is equal to the value of only one part of manufactured product. That part of this product, which is exchanged for resources necessary for reproduction of whole product, is a *necessary product*. The value of the rest part of created product is *surplus product*, sales of which makes a profit and is the reward for entrepreneurial risk.[3]

Similarly, only a part of primary resources is exchanged for final products required for reproduction of these resources (that is, to satisfy the owners' current living needs). This is the *necessary resource*. The rest part of resources is the *surplus* or *saved resource*, the sale of which generates owners' saving and which is the reward for his abstention and frugality. The more the owners' abstention is the more

1 The separation of production factors and their services was particularly important for Walras. He believed that without this it is impossible to understand neither pricing, nor capital markets or problem of interest. [3]. Similar is Marx's position regarding the delimitation of labor force as a production factor, and a labor as its service. He writes: "He must constantly look upon his labour-power as his own property, his own commodity, and this he can only do by placing it at the disposal of the buyer temporarily, for a definite period of time. By this means alone can he avoid renouncing his rights of ownership over it" [4, p.178]. "Therefore the labour-time requisite for the production of labour-power reduces itself to that necessary for the production of those means of subsistence; in other words, the value of labour-power is the value of the means of subsistence necessary for the maintenance of the labourer" [4, p.181].

2 As we see the "products" and "resources" are relative concepts. The economic goods simultaneously are the products for their producers and the resources for their consumers. Therefore, it is necessary to give a clear criterion for distinguishing these categories. For both production and consumption sectors "primary resource" is a good, which is consumed in given sector, but is produced - in another. The "final product," on the contrary, is produced in this sector and consumed in another. "Intermediate product (resource)" is produced and consumed in one and the same sector. This also implies that primary income of one sector is the spending of opposite sector for the purchase of goods produced in the former sector. Accordingly, for production sector the primary incomes are incomes from the sale of final products, but for consumption sector - incomes from the sale of services of production factors (i.e. salary, interest, rent and profit.).

3 "… Sraffa's work … provided a basis for a definitive demonstration that the theoretical analysis of wages, profits, and prices, within a surplus approach, was entirely independent of any 'labour theory of value' and, indeed, that any labour theory is necessarily a barrier to the development of a surplus-based theory" [9, p.12-13]. "… a surplus approach to profits and prices has absolutely no need of any 'labour theory of value'" [9, p.16].

resources are saved from their current consumption. The total amount of reproduced resources depends only on the amount of production factors, which are in owners' possession, but not on the volume of their consumption. [5], [6].

5. Surplus value is created both in the process of transformation of final products into the primary resources and in the transformation of primary products into the final products. In the first case it is done through abstinence, in the second - through entrepreneurship. Producer sells surplus products and makes profit and the owner sells the surplus (saved) resources and makes saving. Respectively, income and saving are the net income of economic subjects, the difference between incomes and expenditures which they received through entrepreneurship and abstinence.[4]

6. Unlike the consumption of usual goods, consumption of capital goods is the consumption in debt, during which the capital wears out. For restoration of worn and for net increase of capital, in parallel to consumption, it is necessary to set aside from incomes the means for investment in production of new capital. The only source of investment in physical and human capital for producers is the gross profit, and for consumers - gross saving. But as the gross profit and gross saving are generated from surplus product and surplus resource, in reality the surplus product and surplus resources are invested. Money itself cannot produce the capital goods. It requires products and resources. Investing just means that part of the products and resources is used not for production and consumption of current consumer goods, but for production and subsequent consumption of capital goods. Investment of profits and savings in physical and human capital is only a monetary expression of real investment of surplus products and surplus resources.

2.3. Profit and Saving

1. The transformation of some goods into another in market economy takes place. In result of these transformations and further exchange of goods the profit remains in production sector, and the saving remains in consumption sector. But since the production and consumption sectors are interconnected through market exchange, then profit and saving are also internally interconnected. In fact, the alternation of incomes and expenditures takes place in both production and consumption spheres. Producers' incomes are consumers' expenditures and producers' expenditures are consumers' incomes. Accordingly, the difference between incomes and expenditures takes for them the mirror opposite forms of profit and saving. That is why the gross profit and gross saving are internally interconnected. As soon as incomes of some are expenditures of others and vice versa, the profit and saving cannot be independent variables. Changing of exchange proportions between the final products and primary resources (i.e. their relative prices) has effect on the profits and saving in opposite way. Naturally, in conditions of equilibrium prices the gross profit and gross saving should match. [5-7].

2. Unlike consumption of owners, entrepreneurs' consumption is consumption in debt. From economic point of view the entrepreneurs invest funds from their monetary assets for his own subsistence without knowing in advance whether its consumption expenditure will be compensated by the results of his activity. That is, he consumes in debt from future income.

3. Producer, thanks to expenditures, receives incomes and the consumer - thanks to incomes carries expenditures. Producers first carry expenditures, then receive incomes. Consumers – vice versa. A producer makes economic decisions regarding expenditures depending on the incomes expected in future, but a consumer - depending on the previously received incomes. Therefore, the profit making is associated with entrepreneurial risk and the making of saving - with thriftiness.

4. Society as a whole, as well as each economic subject simultaneously is producer and consumer. Therefore, in both capacities it simultaneously is both entrepreneur, and saver. Producer is not only an entrepreneur, but also a "saver," because he does not spend received income entirely for the continuation of production but saves a part of income. Just this «saving» is withdrawn profit. And making decision about spending, producer calculates not only profit expected from future incomes, but also - what "saving" will remain from previous incomes. Also, consumers are not only saver, but also "entrepreneur." For taking decision regarding the current expenditures he takes into account not only which saving will remain from the past income at the end of the current period, but also whether there will be excess of future income above the current expenditure, i.e. whether will be "profit."

Therefore, all economic actors make each decision regarding expenditures taking into account both received and expected income. Consequently, the decision is taken from the position of both savers and entrepreneurs. Since in general case the excess of expected income above current expenditure is his profit, then excess of already received income above the current expenditures is saving. And in the alternation of incomes and expenditures from subject's position depends whether the difference between incomes and expenditures will be considered as profit, or - as saving. That is "entrepreneur" and "saver," "profit" and "saving" are the same reflective concepts as the concept of "producer" and "consumer" [6, p.98-99].

2.4. Investment and Consumption in Debt

Generally investment means the transformation of income into capital. But naturally, only that part of income can be

4 At that, since the primary resources exist only in the form of production factors' services, i.e. in the form of a process, which occurs over time (which is irreversible), the saving of these resources is possible only in the form of money obtained by selling them or in materialized form (work in process, finished products). In other words, saving of primary resources means abstaining not from their use at all, but from their use to meet current needs and, therefore, implies their use for investing them in one form or another.

transformed in capital, which is not consumed, i.e. saving or profit. But money cannot produce real capital goods (whether physical or human capital). Production of real capital goods requires real goods (products and resources). It is possible to transform into capital goods only those goods, which are not used in current consumption. Such are only surplus products and surplus (saved) resources. Investment as a function implies the transfer of surplus goods *on a credit basis* to the direct producer for production of (physical or human) capital in the hope of obtaining benefits in the future. Accordingly, the production of capital implies the *consumption* of surplus goods *in debt*. These functions of investment and production of capital are different functions and can be performed by either different, or the same actor. But in any case, *investment implies consumption in debt* and one is impossible without another. The economic sense of this process is that the investor provides his resources in credit to producer of capital, but the producer consumes these resources in debt. [6, 7].

2.5. Needs, Utilities and Costs

1. Economic needs are only "solvent" needs. If the needs cannot be satisfied because of lack of resources, we cannot regard them as economic needs, as the real incentives of economic activity. Economic utility is the ability of limited resources to satisfy the solvent needs of people. Economic utility and needs are correlated concepts. In the process of satisfying needs, these resources are consumed, i.e. they disappear as a utility. But the subject perceives disappeared utility as costs. Consequently, the utility of limited resources is the ability of those resources to be spent usefully, the ability to be transformed into costs. The more deficient the resources are the more carefully man regards them, the more economic utility they represent before satisfaction of his needs, and the more economic costs - after satisfaction. The costs, as well as the utilities, are not the objects. Economic needs, utilities and costs are the specific economic attitudes of subject to objects. These concepts imply each other, but without each other they lose any sense. However, because they imply each other internally, and each transforms into the other in the process of economic activity, so it is clear that there exists something else behind them, that they are different forms of manifestation of some third concept, general for both of them, which integrates them into itself as the different sections of a single whole. This third concept, which synthesizes them, is "economic value". Since economic values are a unity of utility and costs, the market prices in which they are manifested also reflect the unity of goods and the costs of their production.

2. On the systemic level, both resources and products are essentially the same limited goods, and utility and costs are their economic values, as man's specific attitude to these goods. But on the level of separate acts of activity, the limited goods inevitably appear in the form either of a resource or of a product, and man regards them either as utilities, or as costs. So, the value of one and the same scarce good appears before the consumer in the form of economic utility and before the producer of this good in the form of economic costs. However, people are consumers and producers simultaneously. This is stipulated by the logic of economic activity. And the products themselves are resources for producing other products and so on. Accordingly, utilities are destined to be transformed into the costs, and the costs are destined to create utilities. Because of this, not only does the value of resources (including the primary resources) stipulate the value of products (including the final products), but, conversely, the value of products also stipulates the value of resources.

If you collect together all above reasoning and recognize the dialectics of economic processes in the context of the integrity of a decentralized economic system, we inevitably come to the understanding that the economy is a closed, self-organized system of recursive processes. Due to the circular organization of economic processes such systems have a number of unique properties that have been well studied in chaos theory, constructivism and second-order cybernetics. This allows to appeal those unique studies for explaining economic processes in the format of interdisciplinary analysis. That's why the interdisciplinary analysis of these processes can give us the answer to many unanswered questions in economics.

The operational closeness of market economy becomes particularly evident through mathematical modeling.

3. “Symmetric Model” of Economic Equilibrium

3.1. Circular Organization of Economic Processes

1. This model is a model of an ideal equilibrium state of the economy, which shows how the economic forces arise, where directed and how they interact in such a way, that they provide the homeostasis of the economic system. So it is a model of the attractor of economic system, the state to which the system always aspires, but never reaches it because of the deviating influence of external and internal factors. Today, the very idea of economic equilibrium is increasingly being attacked by economists and more and more attention is being paid to disequilibrium models. But imbalance as such in any case implies equilibrium as a potential state, only relative to which it can exist. Economic equilibrium does not exist in fact, but potentially exists always, as an attractor, without which the system will lose integrity and fall apart. We cannot understand how a real disequilibrium economy functions if we do not understand how the forces that constantly push it to equilibrium arise and ensure order in the organization of economic life of society. But to create an adequate equilibrium model, it is necessary to present the market economy as a complex, non-linear, functionally closed and causally open system of economic actions. The self-organization of a market economy is carried out through the positive and negative feedbacks, the circular organization

of economic flows and recursive processes. Recursive processes in the economic system, as well as in other complex nonlinear dynamical systems, generate "eigenvalues" ("fixed points"). These "eigenvalues" are the equilibrium prices and quantities to which through the recursive processes tend the actual market prices and quantities, thus providing a tendency of the system to the general equilibrium.

2. Here is considered a decentralized closed economic system in which final products (m) are produced through consumption of primary resources (n) and primary resources are reproduced through consumption of final products. In order to simplify the model, the intermediate products aren't considered. The market economy is represented as a system in which "production of commodities by means [of consumption] of commodities" takes place (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. In 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). All goods are produced by ones and consumed by others, 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.

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 in result of buying, the prices of goods "neutralize" incomes, at the same time 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. As production value it is extensive magnitude and is composed from (objective and subjective) cost elements, which are shown in the rows of matrix. But as a consumption value (utility), it is intensive magnitude and as such it does not **composed** by any elements, but itself **decomposed** on the elements of matrix' columns. Since the elements 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. Therefore by horizontal summation we get the social cost of products, supplied in the market. By vertical summation we get the amount of money that society has paid for their buying and that expresses the social utility of the total output of industry.

Table 1. Matrix of closed economic system

Sector 1						**Sector 2**	
$-a_{11}x_1v_1$	$-a_{12}x_1v_2$	. . .	$-\alpha_1 A_1$				x_1p_1
$-a_{21}x_2v_1$	$-a_{22}x_2v_2$	. . .	$-\alpha_2 A_2$			x_2p_2	
. . .	. . .	. . .	. . .		. . .		
$-a_{m1}x_mv_1$	$-a_{m2}x_mv_2$	. . .	$-\alpha_mA_m$ $-$ **P'**	x_mp_m I = S			
			P = Q y_nv_n	$-$ **S'** $-\beta_nB_n$	. . .	$-b_{n2}p_2y_n$	$-b_{n1}p_1y_n$
		.. . .		. . .	. . .	. . .	. . .
	y_2v_2			$-\beta_2B_2$	. . .	$-b_{22}y_2p_2$	$-b_{21}y_2p_1$
y_1v_1				$-\beta_1B_1$	. . .	$-b_{12}y_1p_2$	$-b_{11}y_1p_1$
Sector 3						**Sector 4**	

x_i - goods produced in sector 1 (consumed in sector 4), i = 1,2, . . . , m;
p_i - value of goods x_i (equilibrium price), i = 1,2, . . . , m;
y_j - goods produced in sector 4 (consumed in the sector 1), j = 1,2, ..., n;
v_j - value of the goods y_j (equilibrium price), j = 1,2, ..., 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.

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.

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:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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: $P = Q = I = S$, 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 $P = Q = I = S$ and thus to equilibrium of entire system. (Below, sector 1 is denoted as the *production sector*, and the sector 2 as the *consumption sector*. Consequently, the value embodied in surplus product (column n in 1 sector) in monetary terms takes the form of *gross profit*. But the value embodied in saving resources (column m in 4 sector) in monetary terms takes the form of *gross savings*.)

Formulas 3-6 and 12-15 are obtained by summing the elements of the rows and columns of the matrix. The sum of production spending and profits compose the product price and the sum of consumer spending and savings compose the price of resource. Quantity of goods sold in the market equal to the total quantity of invested and consumed goods. At that, the minimal level of products' output is determined by the minimally acceptable level of society's consumption. Similarly, the maximum level of reproduction and realization of resources is determined by the total amount of production factors (respectively, their services) existing in society.

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.

Changes in the technological and consumption coefficients are caused by non-systemic factors such as development of technologies, science and education, changes in consumption preferences, in propensities to save and propensities to entrepreneurial risk, etc. But the prices and quantities of goods, the rates of profit, saving and interest are changed due to intra-system processes. Self-regulation of these prices, quantities and rates are caused by operational closeness of economic system and by recursive processes occurring in it. It provides a general tendency of system to the equilibrium. But environment causally effects on the processes of production and consumption. Changes in technological and consumption coefficients, caused by exposure of environment, determine the permanent deviation of the system from equilibrium. That is, the economic system is operationally closed but causally open, which causes many of its specific properties. All the above mentioned parameters are interrelated. Accordingly, production, consumption, exchange and distribution are also organically interconnected within a system.

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. Discrepancies appear between production and consumption, supply and demand, cost and utility, production and consumption values. Deficient and surplus goods appear. 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 $\alpha_0 = \beta_0 = r_0$.

It is also noteworthy that the macro-economic parameters in the model are formed directly on the basis of microeconomic processes. There is no break between the micro and macro processes. The system has infinitely many solutions.

4. Circular Organization of Economic Processes

4.1. Decentralized Economy as a Cybernetic System

1. The “Symmetric model” is based on a dialectical analysis of the fundamental economic categories. This analysis has 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, correspond to the provisions and principles of second-order cybernetics. 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” [10, p.288].*

The formulas of "symmetric model" show that the intra-system processes in the economy have the recursive nature. The equilibrium prices and equilibrium quantities in this model represent a closed system and are set by recursive operations. In this regard, very interesting is H. von Foerster’s idea. In the above-mentioned book, he cites the following equations: $x' = D(x,u)$, $u' = S(u,x)$, $x_{t+1} = D(x_t,u)$, and $u_{t+1} = S(u_t,x)$, and then writes:

> *“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.“ [10, p.315].*

In the "Symmetric model" such "Eigenvalues" are the equilibrium prices and the equilibrium quantities of goods, to which the actual prices and quantities tend. Mathematicians call the "eigenvalues" also "fixed points", which are used in the Arrow-Debreu model, game theory, etc.

> *„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." [10, p.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.

As we can see, the mechanism of self-regulation of market economy is based on a recursive process in a operationally closed system. To find out this has become possible only after the market economy has been presented as a operationally closed system of economic processes. But to present it in this form has become possible only in result of dialectical analysis of economic phenomena. This fact once again confirms the importance of the dialectic method for understanding how a decentralized economy operates.

2. After the beginning of the 50s, when K. Arrow and J. Debreu published their model of general economic equilibrium, it has become an integral part of the neoclassical paradigm. But critics of this model correctly point out that it is very abstract and does not reflect the reality. Indeed, the assumption underlying the model, and the conclusions reached are absolutely unacceptable for unbiased scientific analysis.

"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 ... In short, the Arrow-Debreu proof had more to do with mathematical logic than with economics." [11, p.3].

At that, the model does not display how the system approaches to equilibrium. Moreover the model implies the possibility of existence of equilibrium in a certain moment of physical time. In the Arrow-Debreu model „... time is treated in a way analogous to one aspect of its treatment in Newtonian physics. In classical mechanics, we say that time has been geometrized or spatialized in that the time coordinate is treated just like one of the other coordinates." [12, p.19]. Therefore it has become necessary to know the initial state, from which the system starts to move toward equilibrium; to know the products, that will be produced in the future, and resources for their production; to know the consumers' future needs, casual circumstances in the future, etc. That is, it became necessary of absurd assumptions.

As R. Heilbroner rights: „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." [13, p.128]. In addition, adds R. Heilbroner, there is another conceptual key problem, 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 or premise." [13, p.129].

3. These problems do not occur in the "Symmetric model" as the understanding of equilibrium in it differs from its understanding in the Arrow-Debreu model. The equilibrium is understood as a state in which the system only tends from any actual state due to an immanent logic of intra-system processes, but never reaches it because of destabilizing factors of the environment. These factors can be: natural conditions, social processes, new technologies, changes in consumer preferences, etc., the influence of which in the model is reflected in the changes of technological and consumption coefficients. Therefore, it is not necessary to know the initial conditions in the past or what will be in the future technologies, preferences, environmental conditions and other unforeseen circumstances that cannot be known in advance. Thus, the aforementioned "completeness", about which R. Heilbroner writes and which is necessary for identifying the "fixed points" (equilibrium prices) initially is already meant by "Symmetric model", because due to the operational closeness it already implies in itself all possible sets of equilibrium prices and quantities at the given restrictions. As for circularity (according to which the distribution of current incomes depends on their distribution in the previous periods, and which, as R. Heilbroner writes, "deprives the array of simultaneous equations of the very thing needed to establish order – namely, a knowable, objective starting point or premise."), according to a recursive models in general this fact is not a flaw, but a significant advantage of "Symmetric model". Regarding a circularly organized processes Foerster writes:

"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. … 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, but to raise it to the honorable position of a "circulus creativus", a creative cycle." [10, p.230].

Therefore, although the "symmetric model of" is a static model, but the dynamics implicitly imply in it, because, as was noted, recursive processes lead the system to an equilibrium (as to its "attractor") from any initial state. But because of the permanent impact of random external factors the technological and consumption coefficients are constantly changing. So the general equilibrium is never achieved. This unceasing movement toward equilibrium, which cannot be reached, just is that "dynamics", which is implicitly assumed in this seemingly static model.

4.2. Problems Caused by Violation of Feedbacks

1. This model allows us to understand the reason for the slowdown in economic growth. Competition itself generates monopolies that block the self-regulation of market prices at the micro level, and the polarization of incomes, which distorts feedbacks and blocks self-regulation at the macro level.[5] It is evident from the model that in the process of production of goods the incomes are created, by which these goods must be realized. "Production creates its own demand" (Say). But if these incomes are distributed very unevenly, then a part of the incomes flows out of the circulation of money-commodity flows of real sector into the financial sector because of high propensity to save of rich minority. For the rest of the society is not left enough income to support the demand needed for realizing of manufactured goods. In conditions of sharp polarization of income distribution, the aggregate demand is lower than in the conditions of equal distribution. [1]. Since weak demand slows economic growth, it becomes necessary to sustain demand artificially.

2. After the "Great Depression", the stimulation of demand by fiscal methods led to the stagflation of the 1980s. But the replacement of fiscal methods by monetary methods through economic liberalizing led to the "Great Recession" 2008-2010. That is, artificial stimulation of demand inevitably ends in a natural collapse. This does not solve the problem, because the reason lies much deeper.

On the one hand, incomes naturally generated in the real sector for the realization of goods produced in it, flow away from the real sector to the financial sector and weaken demand. On the other hand, for the artificial support of demand, the banking sector credit consumption, while creating and injecting uncovered money into the real sector.[6] Therefore, formation of demand and clearing markets is less dependent on self-regulation of real sector, and increasingly - on the unstable financial sector and on the balance of cash flows between the real and financial sectors. If before financial sector served to increase efficiency of real sector, over time it acquired independence, began to dominate over real sector and prevent its stable growth.

3. Commercial banks that create uncovered credits and money, instead of productive investment begin to credit consumption, mortgages and speculative transactions. [14]. The financial sector is rapidly growing in a liberal policy environment. To maintain economic growth rate of GDP requires an advancing growth rates of credit and consumption in debt. The ratio of credits to GDP sharply increases.[7] But credit expansion cannot last forever.[8] Sooner or later, loans will have to be paid back from future incomes. Therefore, aggregate demand and nominal GDP will inevitably decline in future. There comes the "Minsky Moment" and the financial bubble bursts causing an economic crisis. [17]. Financial instability is inherent to the very mechanism of such method of maintaining demand.

4. Similar processes are generated at the global level.[9] With globalization, the national economies have become heavily dependent on each other, because they become parts

5 In the USA by 2007 "the top 1 percent get in one week 40 percent more than the bottom fifth receive in a year; the top 0.1 percent received in a day and a half about what the bottom 90 percent received in a year; and the richest 20 percent of income earners earn in total *after tax* more than the bottom 80 percent combined." [1, p. 15]. "... over the last three decades those with low wages (in the bottom 90 percent) have seen a growth of only around 15 percent in their wages, while those in the top 1 percent have seen an increase of almost 150 percent and the top 0.1 percent of more than 300 percent." [1, p. 17].

6 In a certain sense "bad money drives good money out of circulation"

7 On average across advanced economies private-sector debt increased from 50% of national income in 1950 to 170% in 2006. [15].

8 "For 50 years, private-sector leverage—credit divided by GDP—grew rapidly in all advanced economies; between 1950 and 2006 it more than tripled. .... Leverage increased because credit grew faster than nominal GDP. In the two decades before 2008 the typical picture in most advanced economies was that credit grew at about 10–15% per year versus 5% annual growth in nominal national income. And it seemed at the time that such credit growth was required to ensure adequate economic growth. ... We seem to need credit to grow faster than GDP to keep economies growing at a reasonable rate, but that leads inevitably to crisis, debt overhang, and post-crisis recession." [16, p. 7]

9 "The wealth of the world is divided in two: almost half going to the richest one percent; the other half to the remaining 99 percent. "[18, p.1]. "Almost half of the world's wealth is now owned by just one percent of the population. The wealth of the one percent richest people in the world amounts to $110 trillion. That's 65 times the total wealth of the bottom half of the world's population.... The bottom half of the world's population owns the same as the richest 85 people in the world." [18, p.2] "Around 80 percent of the world's people have just 6 percent of global wealth. Indeed, just 80 individuals together have as much wealth as the world's poorest 3.5 billion people. Such inequality has become a serious problem— both for economic efficiency and for social stability." [19, p.65].

of single world economic organism. In such conditions, due to the excessive polarization of the world on poor and rich countries and pumping of world resources from one to another, the development of both is constrained. Because of low resource prices and low incomes of poor countries, these countries' ability to pay is insufficient to present demand to rich countries for their products, which would match to their production possibilities. The optimum balance between world prices for products and resources is violated. The optimal commodity-money flows and feedbacks between national economies, as the parts of global economy as a single organism are violated. In circumstances, where a third of humanity lives in poverty, such polarization on national as well as on international level is not only immoral, but from a purely economic point of view, has become an obstacle for economic progress. The optimal functioning of economy does not imply such polarization, but only supporting of optimal proportions and feedbacks between the economic flaws.

As we see the laws of cybernetics confirm Marx's prediction. The capitalist economy is experiencing systemic problems. But this happens due to the self-destruction of feedbacks. The market economy cannot eliminate economic inequality which generates itself. Spontaneous market self-regulation becomes impossible, and its replacement by regulated economy - inevitable. Future economy is an economy of social justice.

4.3. Symmetry and Relativity

1. One and the same phenomenon is perceived differently by different persons and even by the same person, depending on his needs and the ends. Also one and the same object or process performs different functions at the same time, simultaneously exists in different relations to different subjects and objects. To be a producer, consumer, product, resource, etc. - all this is not inseparable real properties of objects or subjects, but the functions that they perform. It is impossible to be a producer of goods, not being a consumer of other goods and it is impossible to be a consumer, not being a producer, and it is impossible to be either one or the other, without being the seller of the goods and the buyer of other goods, and it is impossible to be either the seller or the buyer of the goods not being a buyer and seller of money. And in conditions of division of labor, each of these functions he can perform each of these functions 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. [5], [6]. In the end, we find that all the functions performed by different actors are also interrelated 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. Through this they form and reproduce the structure of system. A functionally closed structure of a system or operational closeness, that is a circular organization of intersystem functions, is reproduced by the sequence of performed actions. The "symmetric model," considered above, 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 each other.

2. In this model is reflected the essence of economic equilibrium. That is, the model shows that ideal state of decentralized economic system in which the mutually opposing economic incentives completely balance each other. The "Symmetrical model" reflects only the relative values (relative prices and relative quantities) of produced, consumed and traded goods. The price and quantity of each good is a function of all other prices and quantities. In other words, the model shows the relationship between the intra-system parameters in case when all that is produced is consumed, and all that is consumed is produced. Therefore, goods are exchanged in such proportions that in the market are not remained unsold goods or idle money (unsatisfied demand). In short, this is the *relativity theory of general economic equilibrium*.

3. According to dialectics the cognition of essence implies the cognition of wholeness and its inner contradictions, hidden reflexivity (and, consequently, of implicit symmetry) of subject. This whole is closed and stable. For example, the economy as a system of production and consumption is the wholeness which contains all the necessary parts. This is closed process which possesses an inner symmetry - only that is consumed which is produced, and only that is produced which is consumed. But if for some reason the feedback between production and consumption (mediated by market) will be disturbed, it will disturb the wholeness and inner symmetry of the system. Will be produced products for which will not be solvent demand, the products will not be sold, production will be stopped, will not be demand for resources, and etc. This phenomenon is known from cybernetics - if there is no closeness the dynamic process loses stability. So it is clear that the weakening of reflexion reduces the effectiveness of economic processes. If there is no closeness there will be no definiteness and therefore will not be optimality. Open systems cannot be optimal. [20].

4. Usually the term "symmetry" is used in two meanings. Symmetric means something proportional; it shows the way of integrating of different parts into a single whole. The second meaning of the word is equilibrium. The economic system exhibits property of symmetry in both meanings. The various economic flows are mutually coordinated, complement and balance each other and form the wholeness as a self-regulating system with "feedback". The famous German mathematician, physicist and philosopher Hermann Weyl wrote in his "Symmetry":

> *"…. we had to understand that the general organization of nature possesses that symmetry. But one will not expect that any special object of nature shows it to perfection. Even so, it is surprising to what*

extent it prevails. There must be a reason for this, and it is not far to seek: a state of equilibrium is likely to be symmetric. More precisely, under conditions which determine a unique state of equilibrium the symmetry of the conditions must carry over to the state of equilibrium." [21, p.25].

A man and his activity is a part of nature, and therefore human activity as well manifests symmetry, as other forms of nature.

"There is no law of physics that does not lend itself to most economical derivation from a symmetry principle. However, a symmetry principle hides from view any sight of the deeper structure that underpins that law and therefore also prevents any immediate sight of how in each case that mutability comes about." [22, p. 4].

Famous physicist Paul Dirac in his memoirs about Einstein wrote that Einstein believed that the space-time of our world has such symmetry, and to this space it is necessary to attribute all physical laws. Einstein believed that his four-dimensional symmetry is mathematically so beautiful that it just must be right. Einstein was firmly convinced that the laws of nature must be written in the form of beautiful equations. He considered it essential. Just the search for beauty formed the basis of Einsteinian working method. [23].

"Symmetry is so integral to the way the universe works that Albert Einstein used it as a guiding principle when he devised his General Theory of Relativity. … Many scientists suspect that there may be more natural symmetries waiting to be discovered. Some think that the so-far elusive "Theory of Everything," which physicists have spent decades searching for, will contain some type of universal symmetry that fully explains and knits all the known laws of physics together." [24].

I also deeply believe that the model of economic equilibrium which adequately reflects the economic reality should be symmetric.

5. Conclusions

1. The market economy is a complex, nonlinear, operationally closed (but causally open) system of economic actions. On the basis of dialectical analysis of decentralized economic system we get an entirely new interpretation of economic categories and relations between them; we obtain a new understanding of economic equilibrium.

The main contradiction that drives the economic system is that each subject consumes something that others produce and produces what others consume. Therefore, one wants to buy something that belongs to another person and sells something that other people lack, but belongs to him. That is, the satisfaction of one's own needs is mediated by the satisfaction of others' needs. Thanks to this, all subjects are attached to each other by their action, forming a single whole, a system in which all that is produced is consumed and all that is consumed - is produced. In such conditions, each economic action generates another action. That is, there arise recursive processes, owing to which the economic system becomes closed self-reproducible system generating its own elements.

From the very beginning of its existence, from the 1940-1950s (the concept of N. Wiener, U. Ross Ashby, X. von Foerster), one of its central concepts is the idea of circular causality. Here, the effect caused by some reason, itself becomes the reason causing the effect. Action generates the action, the cause generates the cause and they both generate each other. 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.

In result of this approach, we find that the self-organization of a market economy is carried out thanks to a recursive processes (commodities are produced by commodities, prices are formed on the basis of prices, actions generate actions, satisfied needs create new unsatisfied needs, etc.). Recursive processes in the economic system as well as in other complex nonlinear dynamical systems generate the "eigenvalues" ("fixed points" - in the terminology of mathematics). The equilibrium prices and quantities are just such "eigenvalues" to which the actual market prices and quantities strive because of recursive processes, providing a system striving toward the general equilibrium.

2. The "Symmetric model" of general economic equilibrium is the model of the attractor - a relatively stable, latent structure of that state of the economic system, towards which the decentralized economy always strives by virtue of the immanent logic of the development of intra-system processes (but never reaches it due to the permanent impact of random external factors – changes in natural and social environment). Mathematical models of nonlinear complex systems show that such systems "hide" a certain form of organization of intra-processes that are caused solely by their own non-linear properties. That is, structure-attractors can be interpreted as teleological structures, which determine the main trends in the system's evolution. But they do not exist in a physical space and time. Their detection is possible only by means of scientific analysis.

3. The dialectical analysis of the essence of economic phenomena and a model developed on its basis reveal the hidden relationships between economic parameters, which cannot be detected by other methods of research. Although neoclassical theory fixes the relationship between gross saving and gross investment, nevertheless, it is not aware of

the interdependence between gross saving and gross profits, also between gross investment and gross consumption in debt as well. Consequently it ignores the links between the all aforementioned macro-parameters (i.e. saving, profits, investment and consumption in debt), which exist within a closed economic system. But without all this, it is impossible to understand how the reproduction is performed, how the general equilibrium is formed, how business cycles occur. Therefore, without understanding of these processes it is not possible to create an adequate mathematical model of a decentralized economic system and develop an effective economic policy.

4. Operational closeness of a market economy allows a deeper penetration 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 branches. Moreover, the exchange ratios between branches, but not between individuals, are just the adequate average market prices. But individual exchange proportions, individual prices in individual bargains 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 branches produces for other branches as many goods as to fully meet the needs of all other branches. And it itself consumes the products from all other branches to the extent necessary for such production.[10] But in this case, when all sectors produce for others and consume only what is produced by 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 are produced in it and are offered in return. That is, under equilibrium conditions inter-sectoral proportions of production cause the proportion of inter-sectoral exchange of goods. This exchange proportion actually is a closed system of equilibrium market prices. After all, it is all the same how to express these exchange proportions as $xA = yB$ (in case of inter-sectoral 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 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 a system of exchange proportions of type $xA = yB$ is formed, 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 depend on the system of market prices. Once again the circular causality turns out - 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.

5. It follows from this model that under equilibrium conditions the total value of goods of some branch consumed in other branches, equals the total value of goods of other branches consumed in this branch, and the gross profit, saving, investment and consumption in debt equal each other. This can be termed the "Iron law" of general equilibrium. It provides formation of optimal proportions of commodity and financial flaws within the economic organism, which provide its integrity. Self-regulation of market economy consists just of the ability to provide these proportions by means of market interactions of independent subjects. Finally, just this law gives clear understanding of what parts of cost of manufactured products are imputed to various production factors (Labor, Land, Capital, Entrepreneur-ship) by which these products are manufactured. The theory of imputation, based on law of diminishing returns, doesn't give the satisfactory answer to this question. According to this model, like model of Piero Sraffa, the economy is a circular process of "production of commodities by means of commodities." In this sense this model, as well as model of P. Sraffa, is opposite to paradigm according to which the economy is the one-way process directed from "production factors" to consumer products and in which the problem of how primary resources are reproduced isn't considered.[11] [25, p.134].

6. Dialectical analysis of essence is, first of all, comprehension of reflective definitions and internal contradictions inherent in it. Reflected definitions are definitions, which are mirror reflected in each other. Though reflective relations between various concepts are not always

10 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, the goods of almost all other branches are needed.

11 However P. Sraffa considers production of production factors by means of final products in physical sense. For him there is no difference between production factors and final goods, "commodities are produced by means of commodities." For example, for him Labor is commodity produced by means of other commodities (foods, clothes etc.). But with such interpretation of manufacture of production factors it is impossible to answer a question, - what forces form a wage. Unlike early stages of capitalism, when the salary consisted of consumer goods necessary for survival of workers, today there is no direct link between consumption of goods and reproduction of Labor. Ultimately, the consequence of this approach is that from his model remains unclear how national product is divided between profits, wages, etc.

obvious, but having found out a reflection, in such a "mirror self-reflection" it is impossible not to see the phenomenon of symmetry. Symmetry is always associated with order and opposes to chaos. It is one of essential properties of the entire universe. That is why the displays of symmetry of world surrounding us are incalculable. It is not only flowers, architecture or human body. As well, it is elementary particles, Galilee's principle of relativity, laws of conservation of energy and many other fundamental phenomena of physics, biology, society and so on. The dialectic analysis of essence of economic processes allows us to find out in them surprising integrity and symmetry. The comprehension of that symmetry (as well as its accompanying asymmetry) are inherent in economy, as well as to the all other nature, allows us to deeper understand the essence of economy and opens absolutely new possibilities of modeling of economic processes.

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