The Rationale for Increasing the Theoretical Understanding on the Basic Concepts of Economic Theory

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Abstract:

The issues dealing with the process of making rational decisions in the production and consumption, an accurate assessment of results and costs in the economy have been the focus of attention for many generations of economists. Assessment of results and costs in the economy are always associated with consideration of the prices for different types of resources. However, some underlying aspects of prices still require further comprehensive consideration. By now, the economic essence of such basic concepts of economic theory as money, price, and utility have not been studied thoroughly, on an appropriate theoretical level. Therefore, one cannot provide a monistic theoretical justification for many economic phenomena such economic processes as forecasting prices for economic resources, optimization of the market economy operation according to the theories of economic welfare, social (collective) choice, general equilibrium, etc. This study aims to increase the theoretical understanding of the basic concepts of economic theory, which would enable to eliminate inconsistencies and contradictions in their interpretation at the fundamental and applied levels of research.

The methods of scientific abstraction, system and comparative analysis of mathematical models aiming to establish their possible inconsistency and incompatibility, a logical method, as well as economic and mathematical modeling were used as a methodological basis of the research. Upon conducting a comparative analysis of economic and mathematical models that describe the foundations of the economy, we identified their logical inconsistency and discrepancies with the underlying nature of prices, money and utility.

Having analyzed utility functions and the "function of social or aggregated utility", we proved the need for changing the traditional form of these functions, the need to introduce new phenomena, both individual utility functions and social utility functions that consider the system (emergent) characteristics of the economy. The authors propose considering the system (emergent) characteristics of the economy as: the matrix structure of the economy and the limited cyclic-temporal potential of its lifespan. We believe that the focus on the system (emergent) content characteristic of the nature of prices will allow a more accurate prediction and regulation of their future dynamics, and this will also enable to overcome one of the main contradictions of economic theory between the theoretical basis of consumer choices that are made according to utility values and the practical basis of these choices which are always made according to cost parameters.

Keywords: *economic theory, basic concepts, money, price, utility, utility function, matrix structure of the economy, cyclic-temporal potential*

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1. Introduction

The issues of making rational decisions in production and consumption, an adequate assessment of the results and costs in the economy have been the focus of attention for many generations of economists. Economists have also studied in a detail the issues associated with accurate measurements in the economy, careful consideration led to a deeper understanding of the nature of the various aggregation procedures in the economy and the corresponding aggregate economic indicators (Semyachkov, 2013; Stroeva *et al.,* 2016).

Aggregate economic indicators, in turn, can be cost or value indicators only. Therefore, ideas about the nature of prices of resources and money relations are crucial in understanding all price aggregated parameters of the economy.

It is prices that reflect the costs and results of economic activity of individual economic entities, their associations and the society. Indicators such as income and standard of living, proportions and growth rates of the economy, savings, investments and their effectiveness are primarily measured in prices (in monetary terms). However, in this case one means real incomes, growth rates, investments, efficiency, etc. It means that that share of them which was formed due to excessive growth of the money supply defined as inflation should be excluded from the relevant price parameters. If there is no excessive growth in the money supply (zero inflation), then economic parameters expressed in current (true for the present moment) prices reflect the so-called real values of income, investment, economic growth, etc., (Cherkas, 2013; Pociovalisteanu and Thalassinos, 2008; Thalassinos and Pociovalisteanu, 2009).

We believe that the main aspect of the concept "real income" is not actually that they are real (nominal income is no less real than the so-called "real" ones), but that in any form (nominal or real) they are, first, economic parameters of price. That is why the issue dealing with the nature of market prices has always been of interest to economists, from the very emergence of economic science till present day. Modern economics claims that this issue was conceptually solved in the middle of the 20th century. Therefore, the complex nature of prices is not explored in modern science. At the same time, numerous modern works are devoted to the analysis of a specific price level, and predicting its changes.

It should be noted that there are as many forecasts of changes in the level of prices for goods, services, securities, currency and other economic benefits as there are economists (especially during economic crises). These forecasts, as a rule, cover the whole theoretically possible range of changes in price parameters: some predict their growth, while others predict a fall, and others – stability. All these views are aired simultaneously in the form of equal scientifically grounded competing positions (scenarios of price movements and price aggregates). In this case someone can simply guess the actual movement of prices or their aggregates for a certain period.

However, giving the next forecast for the next period, those who guessed it right for the previous period are mistaken, as a rule. With all this in mind, one can see that understanding of the complex nature of prices is far from being theoretically accurate and perfect. Otherwise, we would not have had such disastrous results in predicting the movement of price parameters of economic systems.

The goal of this study is to justify the need for a deeper theoretical understanding of the basic concepts of economic theory (money, price, utility, value) to eliminate inconsistencies and contradictions in their interpretation at the fundamental and applied levels of research.

2. Literature Review

Why is it necessary to explore the deep theoretical basis of prices, the sum of prices, money and monetary relations? This question is more than sound since economic science exists and has been developing for more than 300 years, prices and money being its key concepts. "Economics," E. Malinvaud says, *"focuses on the price which plays the crucial role in the exchange of benefits between the participants in the economic process"* (Malinvaud, 1985).

Therefore, there is a very good reason to assume that these basic concepts have been examined in the economic theory at the proper, high level and do not need additional purely theoretical research. It is believed that such concepts as the utility and rarity of these goods allow defining the level of prices of goods accurately to establish the most profound theoretical foundations of pricing. At present moment utility of resources (goods) as the degree of satisfaction that any individual receives using the resources (goods) belonging to him, and the rarity (limitation) of the actual reserves of resources compared to an individual's needs in them represent the most profound theoretical basis for setting prices for any kind of resources (Zolov *et al.,* 2017).

As most modern economists believe, *"for an individual, the price reflects, to a greater or lesser extent, the social rarity of the products that he sells or buys"* (Malinvaud, 1985). Here, the concept of utility of these resources underlies the concept of resource rarity. Rare or limited resources are only those for which the marginal (incremental) utility estimates are greater than zero.

The ideas on the fundamentals of the market economy (and prices as its basis) are the starting point of all directions and sections of economic theory. However, there have been no significant changes in this field of economics over the last 200 years. It is not a coincidence that Nobel Prize Winner M. Friedman says: *"Little has changed in the main problems that draw the attention of economists: these problems are essentially the same as those dealt with by Adam Smith 200 years ago. Moreover, there have been no dramatic changes in our understanding of these problems"* (Friedman, 1991).

As for the prices of resources and monetary relations, prominent economist and theoretician E. Malinvaud gives the following assessment of the situation that has developed in modern economics: *"In the considered economy, prices are determined within the constant factor and can be measured by the quantity of any good that is accepted as a unit of count. This is often called a calculating economy. Prices are expressed in monetary units. Economics should explain how their absolute level is changing, that is, how the purchasing power of money is changing as this change entails numerous consequences. However, at the present stage of development, microeconomic theory cannot yet be fully applied to solve this problem"* (Malinvaud, 1985).

A little further E. Malinvaud continues: *"Nevertheless, it should be noted that at present the microeconomic theory cannot clearly explain the issues of governance, monetary operations and external relations at the level of rigor that we use. Just as physics has not yet managed to unify the theories of electromagnetism and gravity, our science has not yet integrated the microeconomic theory of the calculative economy with macroeconomic theories of money, public finance and international trade"* (Malinvaud, 1985).

Many other world-renowned economists share the same opinion. For instance, Nobel Prize winner K.J. Arrow notes: *"When I was in my last year, it was cool to mock the medieval idea of a "fair price" (today no student has heard of it or any other theory popular thirty years ago); but a fleeting glance at any modern journal will spot articles on pricing used to determine economic efficiency where modern versions of the same idea are given"* (Arrow, 1974).

The bridge between microeconomic and macroeconomic theories also indicates an insufficient level of theoretical research on the fundamental basic concepts of economic theory. K.J. Arrow writes on this: *"The relationship between micro- and macroeconomics is one of the most important problems of the modern economic theory of general equilibrium which has not yet been solved"* (Arrow, 1993). G.M. Hodgson also points out that the problem of merging micro- and macroeconomics resembles a "puzzle of economic theory" (Hodgson, 1996). The paradox of the situation that has developed in economic theory is highlighted by Nobel Prize Winner R. Zelten: *"Like some other economists, I feel discomfort seeing majestic structures built on a shaky ground"* (Polterovich, 1998).

The "shaky ground", on which "majestic structures" rise, may indicate that there are no fundamental theoretical links in economic theory that reflect the systemic, holistic characteristics of the market economy at the required level. These system characteristics form the basis of market pricing, and hence, the market mechanism of the "invisible hand". Here we rely on the general scientific methodological idea, which implies that *"the proposition that we always return to the origin from which all science emerged is true for any field of science. This refers to the concept of the wholeness"* (Planck, 1966). The labor and marginality theories of value and resource price focus not on

the integrity or the system characteristics of the market economy, but on its individual elements (the labor resource – in the theory of labor value, and the utility of individual goods or sets of consumer goods for individuals – in the theory of utility).

In our opinion, modern economic theory is not as flawless as it may seem at first glance. In this respect, we should mention the review of the results of scientific research performed by V.M. Polterovich (1998 and 1999). He describes the situation in the following way. It is believed that modern economics has reached a high level in a variety of areas. The modern outlook on the research in economics has developed over the last 60-70 years, although some samples of this approach appeared in the 1920-1930s; suffice it to mention the names of J. Hicks, A. Wald, J. Neumann, etc. However, a so-called leap occurred in the 1950s. One of the main roles in creating the modern approach to economic research was played by the theory of public choice (Arrow, 1951), game theory (Neumann and Morgenstern, 1944), the mathematical model of general market equilibrium (Arrow and Debreu, 1954), the theory of the optimum. In the years to come, the number of studies devoted to the development of these areas increased rapidly.

3. Methodology

Applying the method of scientific abstraction, we could establish that the courses of lectures on micro- and macroeconomics, the theory of money, the nature of financial transactions, the theory of optimums for the economy etc., delivered today in universities are based on the ideas of the underlying, fundamental theoretical foundations of all economic processes that were formulated in the 19th century and remain unchanged till present day. These theoretical fundamentals of the 19th century, in our opinion, do not reflect the systemic, emergent characteristics of the economy.

Considering the above, such lecture courses could hardly be called accurate ones, capable of giving theoretical ideas about the fundamentals of economic processes that are adequate to the modern high standards of any research in economics. It is difficult to predict the movement of prices of resources and the sums of prices of these resources if one applies profound theoretical concepts about prices which date back to the 19th century and do not reflect the systemic, holistic nature of all economic processes in their combination. In this case, when predicting prices and the amounts of resource prices, one can rely on statistics only. Observing the changes in prices and price amounts that have occurred, one can identify trends in their movement and extrapolate the actions of these trends to the future.

However, from our perspective, the future state of the economy (primarily the state of prices) is determined not so much by its past states but by real ones, in which the future preferable economic conditions are reflected as dominant-targeted models that are mandatory for implementation. It is the present (today) that gives rise to new trends for all economic parameters that will manifest themselves in the future. Giving the

systematic content description of the nature of prices, one will be able to predict and regulate their future dynamics more successfully. Over the past 60-70 years, mathematical methods have been developing rapidly and have been widely applied in economic research. There has been no section of mathematics that has not been used in this field. Researchers carried out an in-depth study and generalization of the basic models such as, for example, the Arrow-Debreu equilibrium model, the optimal growth model, and so on.

Economic theory was rapidly penetrating one sphere of economics after another. The apparatus of the equilibrium theory and game theory became the basis for the modern theories of international trade, taxation and public goods, the monetary economy, the theory of financial markets, etc. Computer technologies, unprecedented scale of research, improved methods of economic measurement, standardization of national accounts and the creation of powerful international research centers, led to a deluge of economic information available to most researchers in developed countries. This information is constantly updated and expanded.

Over the past half-century, the level of rigor used in economic studies has radically changed. A typical article in a top-level journal should contain at least one of the two: either a theoretical model substantiation of the main theses, or their econometric testing. Texts written in the manner of Smith and Ricardo are extremely rare. There are fewer attempts to create an all-encompassing economic theory, such as A. Marshall's Principles of Economic Theory, or Foundations of Economic Analysis of P. Samuelson. An attempt to systematize economic knowledge was undertaken in the multivolume series of review works (Hand books in Economics). Each volume covered various opinions of dozens of authors who used diverse apparatus. According to V. Polterovich, the principle of the unity of theory has given way to the principle of the coexistence of competing concepts.

At the same time, it should be mentioned that many theoretical discussions in economics are relevant till present day. These discussions held in economic journals intensify now and then, and then dwindle, without any significant shifts in the views of the opponents.

4. Results

The problems economists and researchers encounter when considering the optimal functioning of the market economy, economic welfare theory, the theory of public (collective) choice of economic decisions, the theory of general equilibrium, the theory of aggregation, etc., are of interest to us. Let us dwell on some of them in more detail. Theoretically, the task about the optimum of the market economic system looks as follows:

1.   First, we should define the set of technological possible states of the market economy by specifying m consumption vectors x_i and n net product vectors y_j. Here $x_i \in X_i$ for the consumer $i (i = 1, 2, \dots, m)$; $y_j \in Y_j$ for the enterprise $j (j = 1, 2, \dots, n)$.

At the initial stage of the study, budget constraints (on incomes) of consumers and producers are not introduced, and the price vector (p) is also omitted since such restrictions are "nonphysical".

2.   The total consumption of all goods and services by consumers is equal to the sum of net output and initial stocks for each good:

$$\sum_{i=1}^{m} x_{ih} = \sum_{j=1}^{n} y_{jh} + w_h, h = 1, 2, \dots, q,$$

where indices $h = 1, 2, \dots, q$ represent nomenclature of all produced goods; w_h is the initial stock of good h.

Under these conditions, the task is formulated: which of the technologically possible states of a market economy is preferable (in this sense – optimal). Here, one is guided by the following principles:

1.   The choice between the two states of a market economy depends only on consumption x_{ih}, and not directly on production y_{jh}. It is believed that the goal of production is the consumption by individuals, production is not an end.

2.   The choice between the two states of the economy should be made using the system of individual consumer preferences.

The criterion of production and consumption optimum is formulated as the natural and physical volume of the final product for consumption in the $\sum x_{ih}$ form for all i and h. However, its immediate maximization is impossible, so one should either carry out the procedure of aggregating (comparing) the final product based on some prices, or rationalize all possible states by some other criterion. The first option was explored through applied research, whereas theoretical studies dealt with the second direction.

Theoretical studies enabled the researchers to propose two optimality criteria: Pareto optimality and optimality according to the values of the "public utility function". As we remember, the state of the economy (E^0) is called Pareto optimality if there is no other possible state E^1, so that there is $S_i(X_i^1) \geq S_i(X_i^0)$, $i = 1, 2, \dots, m$ with strict inequality $(>)$, at least for one consumer (here S_i is the utility function of the consumer). In other words, E^0 is Pareto optimality, the state of the economy which does not allow increasing the satisfaction of some consumer, without reducing the satisfaction of at least one other consumer (Malinvaud, 1985).

We know that there are many states of the economy that are Pareto optimal. However, this criterion enables only partial ordering of possible states x_{ih}, but not complete. Researchers try to order a lot of states that are Pareto optimal using the second criterion of optimality – the function of social utility, defined as $U = U(S_1, S_2, \ldots, S_m)$.

Here the function of social utility is used as the basis for a certain "scale of social preferences" or is "a function of public rational choice", given directly on the set of individual utility functions[2]. Thus, the function of social utility is an aggregated function of a set of individual utility functions.

A few main works of Nobel Prize Winner K.J. Arrow examine these issues. The results obtained by K.J. Arrow and his followers are disappointing. There is no function of public rational choice (rational scale of social preferences), *directly* given on the set of individuals' preorders $(R_1 \ldots R_n)$ or on the set of individual utility functions $(S_1, S_2, \ldots, S_m)$. To be more accurate, this function is either contradictory (irrational) or dictatorial.

It was not possible to obtain the universal ordering of market economy states that are Pareto optimal by introducing the "function of social utility". Applied research papers on the problems of market economy optimum set the criterion of optimality through a *value* (for example, the final product of consumption $\sum x_{ih}$ is maximized at constant prices, and one obtains a single (complete) ordering of the state of the market economy). This approach is based on the following theoretical premises:

a)   the prices of all goods (including fixed prices) must reflect their utility, and not just individual utility, but the public utility of these goods;
b)   the utility of goods for individuals should be measurable;
c)   the commensurability of individual utilities is possible;
d)   there are norms of marginal substitution between the satisfaction of different consumers.

These are the prerequisites which currently do not have sufficient theoretical justification. This gives rise to a contradiction between applied optimization models and purely theoretical propositions which do not allow such "applied" optimization of the market economic system. Such a situation in the theory of optimum market economy is not accidental. As we know, the concept of "utility" is one of the main in economics. From the very beginning of economic theory development, the problems were posed and solved in which the category of "utility" was considered as the most important. Throughout the centuries, economists have been discussing the nature of utility, the relationship between utility and price, the ratio of utility and preferences

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[2]*Research papers use different terms to label this function – the function of public decision choice, the aggregate utility function.*

of individuals, the measurability of utility and the possibility of commensurability of individual utilities.

However, one should pay attention to the fact that in any economic research the category of "utility" has always been treated as an individual one, inherent to this or that individual. The definition of individual utility as a utility function of the i-th consumer $S_i = S_i(x_1, x_2, \ldots x_n)$ is still relevant and the only one existing in modern economic theory.

The arithmetic sum of private utilities is used to build the market economic system. This is confirmed by the ideas of Pareto optimality and by the values of the "function of social utility". In accordance with these ideas, the market economic system, in fact, reduces to some arithmetic sum of its elements (parts) that do not possess any systemic or emergent properties.

According to modern scientific ideas, the system does not reduce to the arithmetic sum of its separate parts, but has its emergent qualities. Emergence is the feature of the system to possess some integrity properties (emergent properties), i.e. the properties that are not typical of its individual elements comprising it. These properties are inherent only in all elements of the system together.

A market system (one of the most complex ones) is bound to have emergent properties that its elements, taken separately, do not possess: certain products, services, production resources, individual utilities, etc. The emergent properties of a market economy enable to aggregate all individual types of resources into a single matrix structure of the reserves of these resources, capable of self-renewal. Emergent properties allow coordinating the economic activities of separate market entities in accord with the demands of the market economic system.

In this respect, all the separate types of resources and each of them individually can objectively influence the emergent or system characteristics of the economy, and therefore, in the economic system they are marked as special system characteristics or system estimates and due to their significance, they dominate over any other estimates of these resources (including their individual "utility" estimates $S_i(x)$).

In view of the above, "the function of public or aggregated utility" is not only an aggregate of individual utilities, but an aggregate of such individual utilities that bears and reflects their system (emergent) significance. Then the functions of all individual utilities should change their traditional form $\left(S_i = S_i(x_1, x_2, \ldots x_n)\right)$, reflecting the emergent (system) characteristics of the economy. It is necessary to develop new forms (types) of individual utility functions that consider the system characteristics of the economy. Considering the system characteristics of the

economy, the function of social, or aggregated utility, will be a system economic function of rational choice, or preference.

The problem of compromising diverse economic interests is known to be one of the most important in economic theory. The theory of public (collective) choice is the very area of economics that deals with these issues. K.J. Arrow is the founder of the modern theory of public (collective) choice. His works in this field (Arrow, 1963, 1974; Arrow *et al.,* 1980) have facilitated further theoretical development of this field in recent decades. K.J. Arrow clearly formalized and obtained paradoxical results regarding the theory of public choice.

Let us consider these in more detail. Imagine a society that consists of a fixed number of economic agents. Arrow assumes that there is a basic set of alternatives offered to choose from. In the theory of consumer choice, these alternatives will be sets of consumer goods, in the theory of the firm – the decisions of market participants concerning the allocation of resources. The alternatives are mutually exclusive.

When individuals make their choice, it is considered that they act rationally, i.e. rank the options according to their preference relation (complete, transitive, reflexive and binary relation, in other words – a complete preorder). It is challenging, though, to build a preference relation for the society, which would also be a complete preorder. In fact, we are talking about establishing a social scale of preferences. It is necessary to find such a social utility function that would determine the relationship of preference regarding the society as a whole[3] (Arrow, 1974). The social utility function ("the function of public choice") must satisfy certain requirements, or "conditions", in K. Arrow's terminology. There are five such conditions:

Condition 1. The function of public choice (like individual utility functions) should determine preferences on the same set of alternatives and depend on individual preferences, whatever they may be. This condition is also called the "principle of collective rationality"[4] (Arrow, 1974).
Condition 2. The principle of a positive association between individual and social values shows that "if an alternative rise in the ranking of one or more individuals, while the rankings of all other alternatives remain unchanged, then this alternative will not be lowered in the public ranking" (Arrow, 1974). We can say that this condition implements the Pareto principle and corresponds with it.

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[3]*K. Arrow and others call this function "a function of social choice" or "a function of social welfare". "The function of social welfare," K. Arrow says, "is understood as a process or a rule for which a set of individual preferences $(R_1, \dots, R_n)$ for alternative social states (one ranking of preferences for each individual) leads to a corresponding social ranking of preferences for alternative social states R".*
[4]*"The function of public choice," K. Arrow claims, "should be capable of setting the order for society, regardless of individual preference relations".*

Condition 3. The principle of independence from non-included alternatives: "The public choice among this set of alternatives does not depend on preferences concerning alternatives that do not appear in the set" (Arrow, 1974). Whether society prefers alternative A to alternative B depends only on the opinion of its members on the same pair of alternatives A and B, and not on their views on other available opportunities.

Condition 4. The function of public choice is not introduced at the very start: the establishment of the collective order of preferences cannot be independent of individual preferences. If the function of public choice is set at the beginning, independently of individual choice functions, then the freedom of choice (choice area) for individuals will initially be completely limited, which contradicts the democratic grounds of the market economy (all individuals are separate and completely free in their choice).

Condition 5. The function of public choice is not "dictatorial". The function of public choice becomes "dictatorial" if there is such an individual in the society whose preferences are identical to social preferences, and a claim is proposed that every time the society should prefer the alternative that the dictator chooses.

These five conditions, or axioms, are the basis for conclusions in the theory of public choice. The result established by K.J. Arrow is paradoxical and is called the Impossibility Theorem. If we accept conditions 1-4, then any function of public choice that satisfies these conditions will be either contradictory (irrational) or dictatorial. If we accept all five conditions, then such a function either does not exist at all, or is inconsistent (irrational). If we accept the first three conditions, then the function of public choice will be either contradictory or imposed (not reflecting individual preferences) and from the start completely limits the economic freedom of individuals, or dictatorial, which also implies a complete limitation of the economic freedom of individuals. "But are there other methods for constructing the function of public choice?", K.J. Arrow asks. "The answer is no". "The market mechanism simply does not enable a rational public choice" (Arrow, 1974).

Considering the fact that the market economic system is the most complex holistic mechanism in which the arithmetic sum of separate parts is not equal to the whole, and there are no individual free choices in the mechanism made by all free individuals (economic cells), i.e. some systemic principle that allows one to choose from alternatives considering not only individual economic characteristics (individual utility), but also integral, systemic characteristics, then it is impossible to determine how this integrity is maintained (reproduced). There is no guarantee that the interaction of many isolated individuals with diverse individual economic interests will not destroy the economic system. However, this does not happen in practice. Therefore, we can assume that there is a mechanism for compromising diverse individual economic interests of isolated individuals within the economic system, and under market conditions it is not imposed or dictatorial.

One has good reasons to assume that there is a deep mechanism for combining separate economic interests of market participants with the needs of the market economy as a system. This was pointed out by A. Smith who spoke of the "invisible hand" which spontaneously joins them[5] (Blaug, 1994).

"The invisible hand," as F. Hayek points out, *"should probably be more accurately defined as a pattern that is a pattern invisible or undetectable for direct perception. For example, the system of pricing in a market exchange forces us to act under the influence of circumstances that are practically unknown to us, and which can produce results that we did not plan at all"* (Hayek, 1992). In our opinion, market equilibrium-equivalent prices of resources just directly reflect invisible system characteristics of the economy, and their identification is the main task for economic theoreticians.

Perhaps, there is no section in the modern economic theory (except for the theory of public choice) that so clearly reflects the existing difficulties as economic welfare theory does. It is believed that the economic welfare theory is an area of economic analysis associated with the development of ethical criteria that allow determining which economic system (or the situation within it) is better, or preferable to another one. The basic proposition of this theory is that no one but an individual himself can judge better what welfare means for him, in other words, according to P. Samuelson, individual preferences should be taken into account (Samuelson, 1955). In accordance with this, the state of the economy can be considered "good" or "bad" only regarding individual preferences of its participants.

At first, M. Reynolds and Yu. Smolensky point out, *"many people tend to recognize this idea, but as soon as it is formalized and developed into certain logical conclusions, it raises an antagonistic attitude to itself. Since respect for individual preferences is conditionally accepted as a fundamental ethical proposition, this inevitably leads to the basic idea of the economic welfare theory – the idea of Pareto optimality"* (Minsky, 1981).

Here it is worth mentioning that Pareto optimality is understood as a state of the economy in which the welfare of an individual cannot be increased (through any possible redistribution of resources or products) without reducing the welfare of any other individual. If the economy achieves Pareto optimality, then any further redistribution of resources will inevitably mean deterioration for one individual at least. At the same time, the economy that has not reached Pareto optimality is defined as inefficient. We share the following position of M. Reynolds: *"In general, the conclusions which the economic theory of welfare has drawn so far are predominantly negative: economists have failed to formulate indisputable rules that*

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[5] *"Striving solely for their own good, people are guided by "the invisible hand" to higher goals of society", M. Blaug.*

would allow them to decide what results are desirable and which are not" (Minsky, 1981).

This proposition made by M. Reynolds can be questioned as there are no "indisputable rules". Moreover, one cannot say that the economic theory of welfare and the theory of public choice have not attempted to define the function of public utility (the function of choice). In this regard, it suffices to give the model of Bentham-Edgeworth function (the model of the cardinal type):

$$U = \sum_{i=1}^{m} S_i(x)$$

and Bergson-Samuelson model (the model of the ordinal type):

$$U = U[S_1(x), \dots, S_m(x)]$$

However, economists formulated the problem of the existence of such a function only formally. These economists ask themselves what should be done to deal with challenges facing economic welfare theory. Malinvaud answers: *"To assume there is a real, numerical function of social utility"* (Malinvaud, 1985). At the same time, purely economic, substantial grounds (both at the micro- and macro-levels) are the same: the isolation of economic individuals, the system of individual preferences, the economic freedom of households and firms, and no systemic characteristics of the economy.

In our opinion, before introducing the function of social utility (public choice) into the analysis, it is necessary to justify and reveal its objective basis in the form of emergent, integral, system characteristics of the economy. To do this, one should define the market economic system in a new way, identify its purely system (integral) properties, compare them with the system of individual preferences and only after doing this, try to determine the specific form of the function of a social or aggregated utility (public choice).

There is a good reason when E. Malinvaud says that *"the acknowledgement of the existence of a function of social utility is obviously a very bold step"* (Malinvaud, 1985). When this function is introduced only formally, a new problem arises – the need to measure the utility of various individuals ("consumer arbitrage"). This problem has not been properly solved yet. In our opinion, it is no mere chance since such a measurement is unacceptable within the traditional foundations of economic theory.

As a result, the theory has come to a kind of a dead end. After the formal introduction of the function of social utility, one relies on purely mathematical reasoning using the apparatus of advanced mathematics which includes finding

conditional extremums, and establishing mathematical conditions that determine the optimum of the utility function. At the same time, one has not come up with a meaningful, economic interpretation of these conditions and the very function of social utility, while the results can relate to any class of systems.

A good example of this is unsolved problems of the theory of general equilibrium. In general, there have been some undeniable achievements in this field. For instance, one got evidence confirming the existence of competitive equilibrium. It has also been proved that the equilibrium enables the Pareto optimal distribution of goods and services. At the same time, it has not been possible to find general conditions that ensure the uniqueness and stability of the equilibrium.

In the theory of general equilibrium of the sharing economy (i.e., in the simplest version of the general equilibrium model), we deal with aggregate demand, which is an aggregate of individual demand. The analysis of aggregate demand in the general equilibrium model, carried out by Sonnenschein, showed that this demand does not possess the essential properties of individual demand functions, for instance, uniqueness in interaction with its variables. That is, dealing with aggregated demand $\xi_h(P)$ for certain resources, we deal with point-multiple mappings, when the same variables can correspond to the same set of possible alternative values of the function (in our case, aggregate demand functions $\xi_h(P)$).

Sonnenschein proved that any system of continuous homogeneous demand functions $\xi_h(P)$ of zero order $(h = 1, 2, ..., q)$ satisfying the Walras's law be a set of demand laws for the exchange economy, provided that the corresponding preferences (utility functions) are appropriately selected. Hence, the direction of changes in endogenous variables occurring during changes in exogenous variables cannot be predicted without establishment of the form of the functions of individual utility.

Aggregate demand is simultaneously governed by many laws, which can be considered as a clearly unsatisfactory result. Therefore, researchers began looking for utility functions with "very good" properties. For instance, E. Malinvaud claims: *"if all consumers are equal, their utility functions S_i are completely identical, and the vectors of the initial resources ω_i are all equal, then the functions of aggregate demand will have the very properties that we studied in Ch. II, devoted to individual demand functions"* (Malinvaud, 1985). These requirements fulfilled, the plurality of laws of aggregate demand disappears, but special justification is required to meet these requirements.

Unsolved problems related to the nature of money and monetary relations take a special place in modern economic theory. Money is theoretically not excluded from the general theory of equilibrium, as one might expect, moreover, its presence does not agree with the basic postulates of this theory. For example, Khan points out that

"the presence of money can only be explained only within a model where Walras's law does not apply" (Harris, 1990).

We also agree with the proposition according to which real money located on bank and cash accounts and performing relevant monetary functions in all their diversity is still, despite numerous attempts, not integrated into the general theory of equilibrium. Till present day, money is a "superfluous" link in the theory of equilibrium economic processes. Ostroy formulated this "darned" question of incompatibility of money with the system of equilibrium analysis: *"How to include money into the standard general equilibrium model, so that this model itself does not cease to exist"* (Ostroy, 1973).

A prominent expert in the theory of money, L. Harris airs a similar opinion: *"In this section we saw that the existence of money cannot be explained in the framework of the Walras's economy, even after this model is further developed in the works of Debreu, and it introduces uncertainty and the factor of the future. If we use the method which involves dividing time into market days, then two problems arise. We must explain why money, and not bonds, is used as a means of saving value, to unite a consistent chain of market days (and why such a chain exists). In addition, it is necessary to explain why there is such a medium of circulation designed to facilitate transactions within one market day. The second task is more fundamental, and the proposition on transaction costs is one of the ways to approach it. However, this method should be supplemented with an explanation of why transactions are not synchronized: the lack of synchronization is a necessary condition which enables the existence of the medium of circulation"* (Harris, 1990).

In our opinion, modern economic science is not able to explain the nature of money and monetary relations. Without increasing our understanding of the deep conceptual nature of prices and money (monetary units), it is difficult to answer questions like what the price of an item of goods and the sum of the prices of all goods are, what the cost of a resource is as well as the total value of all types of resources existing in the economy at any point in time $t_{_\text{H}}$ or $t_{_\text{K}}$, or why an individual as well as all people together seek to increase their wealth through increasing the total value of this natural-material wealth only and, finally, what concept may underlie the pure total value of the reserves of all natural and material types of resources.

If we assume that utility volumes underlie the value volumes of resources, then we have to answer the question what is behind the utility volume of resources, the volume of satisfaction that individuals receive, using various types of resources. We assume that analysis of the nature and the reasons for the emergence of money must be carried out strictly within the conditions of the standard general equilibrium model. Admitting the fact that in a real economic system, sales transactions may be unsynchronized, along with the uncertainty of the economic situation and the ineffectiveness of barter exchange, one should focus on other, in

our opinion, more fundamental grounds which led to the emergence of such an economic form as money.

One should try to show that in a market economy where all purchase and sales transactions are perfectly synchronized, there is absolutely no uncertainty about economic prospects, with no transaction costs, i.e. barter can be highly effective in terms of costs; however, there is a serious need for such an economic phenomenon as money and the monetary system to appear.

It is known that "in economics, aggregated models are used for quantitative analysis and forecast of the dynamics of economic aggregates, i.e. indicators obtained as a result of increasing the statistical information on the behavior of various economic agents" (Dadayan, 1984). The use of the corresponding aggregate models, in turn, implies that there is a theoretically valid and practically applicable system for measuring these aggregate values. Any unit of measurement always exists objectively, i.e. it is a phenomenon that is either directly set by the object of measurement, or can be created by people in accordance with the objective laws of this object.

However, as we know, the aggregation procedure used in economics nowadays contains several fundamental contradictions. Well-known international and Russian scientists point out to this.

"The practical difficulties in measuring aggregate prices and volumes are obvious today," says Nobel Prize Winner W. Leontief. "However, referring to statistical publications on the problem of indices, we may find trends that contradict the profound optimism of theoreticians. Setting the task of measuring certain objects, a statistician should first pose a question whether they exist at all. What previously seemed to be a matter involving only practical difficulties has demonstrated features of a logically unsolvable problem". At the same time, at the theoretical level, the problem of aggregating goods, in fact, does not depend on the quantity of goods in question – whether it is about 5,000, 50 or 2 goods (Leontief, 1990).

The final conclusions of well-known economist I. Pearce on aggregation are as follows: *"Finally, the research findings have shown that in the general case the aggregation of goods turns out to be impossible, and this fully corresponds with our opinion on this issue based simply on "common sense". When the problem of aggregation arises, a reasonable approach to the problem is determined by the rule: aggregation should be avoided in every possible way. When we are forced to resort to aggregation, or when suitable conditions for this arise, we should not ask the question: "Is the conducted aggregation correct?"*. Only one question is possible: "How big is the aggregation error?" (Minsky, 1981).

According to I. Pearce, in the general case, the aggregation of goods is theoretically *impossible* and it "should be avoided in every possible way". At the same time, the

development of a macroeconomics theory requires operating aggregated economic data and models. There is a contradiction which I. Pearce fails to see. He believes this contradiction could be overcome by the fact that since one must resort to aggregation (and this is done constantly in macroeconomics) and it is still incorrect and theoretically unreasonable, then it is only the size of the inevitable errors that one has to consider. Thus, it turns out that the whole science – macroeconomics – operates only some values of "unavoidable errors" of aggregated data.

We believe that this reflects a problem – the problem of a different (in contrast to the present) theoretical basis for macroeconomic analysis, the synthesis of macro and microeconomics. Nobel Prize winner K.J. Arrow names the *"relation between micro- and macroeconomics"* as one of the crucial problems of the modern neoclassical theory of general equilibrium (Arrow, 1993).

In this regard, one should also remember an old discussion that took place in the economic papers and concerned the function of aggregate production (the so-called two Cambridge's debate). *"There was a great controversy on the production functions in general and the Cobb-Douglas function in particular,"* M. Bronfenbrenner notes, "both theoretical and statistical. The most important theoretical objections concern aggregation, the most important statistical objections relate to the problem of identification" (Minsky, 1981).

Let us consider the problem of aggregation: even if $x_1 = f_1(y_1), x_2 = f_2(y_2), ..., x_n = f_n(y_n)$, it does not mean that $x = f(y)$, where $x = \sum x_i$, $y = \sum y_i$, unless special restrictions are imposed on functions f_i and f. As we assume, these restrictions come from the objectively existing system (emergent) characteristics of the economy and they should be identified and presented in the form of appropriate economic functions.

Russian researchers have also considered the problems of aggregation in their economic studies. "Statistics widely apply," K.K. Valtukh notes, *"indicators of the physical volume of the aggregate social product, national income, industrial output, etc. Calculations of such indicators are based on the principle of constant prices"*. Further, he says that *"the volume of output expressed in constant prices shows not the quantity of goods comprising it, but the quantity of value (expressed in money) that could be expressed in these goods in the conditions of a certain base year"* (Valtukh, 1974). In fact, in this and other works of his, K.K. Valtukh tries to substantiate the thesis of the inadequacy of constant prices when measuring the physical volumes of aggregate products (resources).

5. Discussion

Considering all the above, one can see there are serious theoretical problems related to aggregation (and, as a consequence, in macroeconomics, its synthesis with microeconomics).

In our opinion, the functions of individual utilities $S(x)$, as well as the function of social or aggregated utility $U(S_1, ..., S_m)$ in the form they are presented in modern economic theory do not reflect the *system* (emergent) characteristics of the economy, and therefore, in this form, are destructive functions.

This means that if preference relations in the market economy (both individual and social preferences) are based on the corresponding individual utility functions $S(x)$ and the social utility function $U(S_1, ..., S_m)$, then individual parts of the economy (economic cells) and the entire economy will collapse, even though all these utility functions can be rational functions.

Today, most economists understand that individual utility functions in the form of "satisfaction volumes" that individuals receive using their goods and services cannot form the basis of their individual preferences (individual pre-orders). If this were so, then neither the individuals striving to maximize their volume of satisfaction nor the economy would have existed long ago.

Therefore, modern economists say that it is not the question of *"the volumes of satisfaction"* that individuals receive, but it is necessary to set certain strict rules that allow individuals to make rational choices out of the numerous possible economic alternatives they possess. The aggregate of these rules for individual choices in the economy was called a "complete preorder".

When comparing various alternative sets of consumer goods x from X, the concept of the "preference order" or a "preorder" is used. This preference order (preorder) is marked with a symbol R and means the ratio of a weak preference. The ratio R includes two relations between any alternatives x from X: the relation of strong preference P and indifference relation I.

If the consumer set x^1 is regarding another alternative set x^2 in the position of a weak preference $x^1 R x^2$, then this means that individual utility functions correlate as $S(x^1) \geq S(x^2)$.

Two other relations follow from this relation:
$x^1 P x^2$, if $x^1 R x^2$, but not $x^2 R x^1$, then $S(x^1) > S(x^2)$;
$x^1 I x^2$, if $x^1 R x^2$, and $x^2 R x^1$, then $S(x^1) = S(x^2)$.

This implies the corresponding axiom properties of the relation.
A.1. For each pair of vectors from x^1, x^2 from X, there are relations of perfect ordering: $x^1 R x^2$ or $x^2 R x^1$.
A.2. For each x from X, the reflexive relation is: $x R x$.
A.3. If $x^1 R x^2$ and $x^2 R x^3$, then $x^1 R x^3$ is the transitivity relation.

A.4. With any $x^o \in X$, the set of all $x\{x \in X | x^o R x\}$ that are not more preferable than x^o, and the set of all $x\{x \in X | x R x^o\}$, to which x^o is not more preferable, are closed in X (the condition of preorders continuity).

"If the system of consumer preferences is set," E. Malinvaud claims, *"we are not interested in the motives for choosing this system, and at the same time we will not a priori exclude any individual ethical system. The only condition is that the requirements of Axioms A.1-A.4 are met which are natural from the philosophical and physical positions, and that they are internally consistent when the choice is made"* (Malinvaud, 1985).

Thus, individual consumers' preferences can be based on any motives or reasons, with a great number of them, and therefore, from this point of view, there can be many systems of individual preferences of consumers. Moreover, each of the systems of individual preferences of consumers from this set of possible systems must possess the properties of axioms A.1-A.4.

This reasoning is a classic example of economists' views on economics as an arithmetic aggregate of economic cells (of consumer and production types) that do not have any emergent or system characteristics. In this case, there is no difference what exactly these economic cells are guided by, it is important only that any possible tendencies of these economic cells obey the formal requirements of axioms A.1-A.4.

However, axioms A.1-A.4 say nothing about whether the system principles of the economy are reflected in their requirements. Will such preferences of individuals contain the system properties of the economy as a whole? That is, will they represent the requirements of the system properties of the economy, and not only the requirements of axioms A.1-A.4. Axioms A.1-A.4 themselves bear no such information. That is why we assume that the set of results obtained in the economic theory applying the desired utility functions is negative.

Thus, if individual utility functions or individual preorders that possess the properties of A.1-A.4 do not contain the requirements for system properties of the economy, then they are destructive for the economy. If individual utility functions and individual preorders contain the requirements of the system properties of the economy, they are not destructive. However, in this case it is necessary to change the traditional form of individual utility functions and individual preorders about the system requirements of the economy.

Describing the state of modern economic theory, V.M. Polterovich notes: *"Many of the most general theoretical results are in a certain sense negative and, in fact, show the incompleteness of initial models"* (Polterovich, 1999).

"Incompleteness of initial models", in our opinion, indicates the insufficient level of theoretical development of the emergent, integral, or system characteristics and properties of the economy and, therefore, the insufficient level of theoretical development of such basic concepts of economic theory as price and the sum of prices, the sum of the values, utility and the sum of the utilities, the monetary unit and the sum of all monetary units.

In this regard, we find it viable to consider a recently published work covering a special study of emergent (integral), or system characteristics of the economy. The matrix structure of the economy and the limited cyclic-temporal potential of its existence are, according to the author of this study, its holistic (emergent), or systemic characteristics (Vasiliev, 2016).

The cyclic-temporal potential of the economy (an emergent characteristic) manifests itself in the ability of the economic system for targeted self-renewal of the stocks of reproducible resources of which it consists. Only those reserves of resources which exist due to the matrix principle of organization are capable of self-renewal. It is established that the matrix of resource reserves always has a limited cyclic-temporal potential of its existence.

All types of resources (goods) objectively contain these integral, or system, characteristics of the economy. Consequently, all types of resources (goods) reflect the system characteristics of the economy through special system estimates – their cyclic-temporal estimates.

While most modern economists believe that *"for an individual, the price reflects to a greater or smaller extent the social rarity of goods that he sells or buys"* (Malinvaud, 1985), we assume that the matrix structure of the economy and the cyclic-temporal potential of its existence is the basis, or "substrata" which determines the structure and absolute levels of prices, or monetary estimates of any kinds of resources. In this respect, prices reflect not the "public rarity of goods", but the cyclic-temporal significance of the goods individuals buy or sell.

Moreover, reflecting the system characteristics of the economy considered above, the prices of all individual types of resources allow all separate individuals to establish this system of individual preferences in the economy without any centralized influence, i.e. the system of individual preorders that ensures the integration of all separate types of resources into the matrix of their reserves with an ever-increasing reserve of the cyclic-time of its existence.

6. Conclusion

In global economic studies there has been no research linking price levels on any kinds of resources with a temporal (cyclic-temporal) potential for the existence of the economic system. As a result, economics has not examined objective

mechanisms for the emergence, exhaustion and development of new temporal (cyclic-temporal) niches of the economic system, without which no economy can exist.

Any society needs targeted development of numerical methods for direct accounting of temporal (cyclic-temporal) economic potential, as well as its changes. Otherwise, the effective functioning and development of the economy, and hence the long existence of society, is hampered.

The development of theoretical ideas on the emergent nature of the economy *is*, from our perspective, the starting point which would allow a deeper theoretical understanding of the nature of prices and values, money and monetary relations, optimal economic conditions in general and the causes of economic and financial crises, etc. Further special research should be conducted on the emergent characteristics of the economy.

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