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Methodology and Engineering of a Sustainable Market Model

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ABSTRACT:
The article presents the authors' approach to the methodology (logic of cognition) of the market, the process of modelling a representative market with the proof of the possibility of appropriate management of the market state. The study was tested on the example of Ukraine's vegetable market according to the development trends of the last 30 years. The functional model of the market was considered by the set of its functional factors and the possibility to identify market efficiency. It is substantiated that regulations should be considered through manipulation of a set of indicators and restrictions, which allows reducing market management to an essentially engineering task, the feasibility of which is determined by the dynamics of increase in the effects of market functioning.

Keywords: market, market model, market functionality, market efficiency, market management.

1. Introduction

Institution of the market can be attributed to the fundamental components of civilization. The process of forming the system of global and national markets was primarily historical be its content. It objectively caused the need for a logical and scientific interpretation of the essence of phenomena of market exchanges, their functionality and efficiency. Thus, a general theory of the market was formed from various ideas and methodologies, at the same time the key provisions of the relevant theory were clarified. Relevant scientific research always aimed to find out the «laws of the market» that would allow to maximize profit. Against this background, the theory of the market can be classified as one of the most controversial. Theoretical and practical concepts surrounding laws and the nature of the market have undergone significant dynamic changes due to objective factors. The validity of theoretical ideas has been scrutinized through the frequency and intensity of economic crises across various periods. Similarly, in the era of the emergence of a post-industrial society, enhancing the market foundation of civilization's economy takes on new dimensions of relevance, particularly amid a substantial threat of similar crises. This is underscored by the consistent focus on market

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issues in the European Union, the United States, and other economically advanced countries globally.

These inquiries become increasingly relevant for nations adopting a market economy, which constitute the majority in terms of both population and territorial expanse worldwide. The ambiguity of the matter arises from the dual nature of the problem. On one hand, the overarching market theory adheres to universal principles, while on the other hand, there is a developing perception favoring the validity of so-called «national» market models. These models seek to accommodate the idiosyncrasies of individual countries. In addition, as it has already been noted, there are alternative approaches to the interpretation of market laws in economic theory. Economic theory does not give a single answer to how balanced the coexistence of such alternative ideas is. Therefore, today in the scientific domain, the issue of modelling the market and the market environment is one of the most urgent and priority ones.

Problem statement. In the scientific literature, there can be found some speculative accents regarding the essence of the market category, its model and efficiency, thus this is treated considering a too wide range of aspects and most often political implications are involved. The term «market» is traditionally interpreted in very different ways. These developments hold significance for contemporary Ukraine, where the potential for market reforms is under active criticism. In 2022-2023, the issue of the possibility to ensure market laws in a warring country has become especially relevant for Ukraine. Therefore, substantiation of the possibility to solve the problems specified is of both general theoretical and practical value. The authors' point of view bases on the hypothesis of the existence of a single model of the market and a universal mechanism of its functioning, correction, improvement, which are mostly referred to as the laws of some phenomena.

The aim of the study is to present a comprehensive definition of the «market model» concept, elucidating the core of a socially acceptable market. This involves unraveling the essence of key categories and components within the associated intellectual framework. At the same time, the emphasis is made on the post-industrial interpretation of the market model (on the example of the market of vegetable products in Ukraine) and its efficiency criteria.

2. Literature Review

Although the studies of the market are one of the most common in economic literature, the scientists whose ideas founded and defined the market theory are quite limited in their number. A. Smith (1994), J.-B. Say (1821), L. Walras (2013), E. Chamberlin (1951), J. Robinson (1979), J. Keynes (1964), F. Hayek (1948), L. Mises (1969), M. Allais (2011), M. Friedman (1956) and other scholars made a great contribution to the formation and development of economic theory and methodology of research of the market transformations. Their research embodies the most widely acknowledged market methodologies. In our view, the significance of the works by contemporary economists addressing market issues, often recipients of Nobel prizes in economics, primarily lies in the technical interpretation of already established conceptual approaches. In Ukraine, certain native scholars, such as V. Bazylevych, A. Halchynskyi, V. Heiets, P. Yeshchenko,

Yu. Zaitsev, S. Mochernyi, I. Radionova, A. Chukhno, and others, have delved into the theoretical and methodological aspects of market formation and transformations. They predominantly disseminate information about the modern market institution through Western interpretations.

Research papers that have been recently published in the world scientific journals analyse the trends in European flexibility markets based on the selection and comparison of the market and aggregator platforms (Schittekatte et. al. 2020). The general methodology for the analysis of these flexible (elastic) market models is presented through the comparison of their description, market structure, market timing, and implementation (Jin at. fl. 2020). Certain scholars, as demonstrated (Valarezo et. al. 2021), justify the approach of analyzing markets using the so-called «new» market models. These models present a lucrative business opportunity, supported by technical and economic reasoning that revolves around the flexibility of distributed resources. The provision of services to distribution system operators (DSOs) is coordinated with transmission system operators (TSOs).

A number of researches (Li et. al. 2013) outline geographic aspects of modelling markets and economic development in general using multi-agent systems that include numerous underlying factors. (Yuan G. et al. 2019) represents a model of market demand conditioned by the perception of information and quality of analysis. When evaluating the role of institutions supporting the market in achieving the goals of sustainable development in developing countries, scholars substantiated the possibility of the influence of the institutional structure of the market on the traditional driving forces of development (primarily through direct foreign investments) (Muhammad et. al. 2022).

It is appropriate to emphasize the approach to market formation (Mattsson et. al. 2023), which involves conceptual integration of political and market practices (market exchange, market representation, and market normalization).

We share the view of some researchers (Kjellberg et. al. 2006); (Storbacka Ključnikov et. al. 2015) that markets should be considered as complex systems that evolve over time, rather than as pre-existing stable structures. Thus, any specific existing market always has a history of its formation, which can explain the state, problems and prospects.

At the same time, according to some studies (Baker et. al. 2019), market formation takes place through the interdependent process that includes institutionalized practices, beliefs and expectations, as well as the deliberate activity of market players at any institutional level.

In general, market modelling is based on the assumption that market changes are joint, repetitive, and recursive, co-created and implemented by diverse groups of recipients, both formal and informal (Ključnikov et. al. 2023); (McMillan 2003); (Wang et. al. 2022). Market makers do not necessarily work in concert; nevertheless, active networks of complementary actors make a positive contribution to the construction of shared identities and normative networks (Moroz et. al. 2016). From a managerial point of view, market dynamics is a scope of analysis for politicians, sponsors, strategists, marketers, sociologists, psychologists, etc.

It should be noted that despite a long history of market theory and practice, a number of issues remain debatable, namely: 1) what constitutes an efficient/inefficient market; 2) what criteria and indicators describe these categories; 3) what functions,

elements, principles determine the activity of the market economic system; 4) what is a real role of regulations and other factors in the market model, etc. At the same time, each of the approaches uses practical experience of a certain time period of a country or group of countries as an argument. Based on these arguments, alternative theories often appear to be true simultaneously. In addition, in the modern world there is a sufficient variety of economic models of market development, which differ significantly, and which, obviously, with equal probability cannot avoid the risk of economic crises, and thus it is not possible to claim the experience of forming a single effective market model. All of the above provides a wide range of directions for further research.

3. Methodology

The research is based on the methodology and general scientific principles of complex economic studies, fundamental provisions of modern economic theory, in particular, its classical and neoclassical interpretations, conceptual foundations of the market theory, scientific research, principles and developments of the leading domestic and foreign specialists.

During the research, in addition to a number of general scientific methods of economic research, a historical method of cognition was used as to describe a retrospective process of formation and development of market relations as well as a logical one to determine a meaningful sequence of the process. The research methodology involved consideration of the representative market as a complex system of factors, which can be fundamentally evaluated, forecasted and modelled into a better state through the engineering of such factors.

4. Case Studies

The term «market» can be defined as the system of exchange of goods and services existing at the moment in a specific society (economic system).

Instead, the issue of gnoseology of the «market» category is fundamental, firstly from the point of view of the process retrospect, and secondly – the selection of key characteristics of the category, which were introduced in different periods of economic history from the standpoint of public expectations from the market, as well as understanding the laws of its functioning.

Thus, as it has been noted, market theory belongs to fundamentals of the methodology of the capitalist world, therefore it has always been the subject of active scientific research. In economic history, the market factor as the main factor in the organization of economic processes has traditionally referred to the era of mercantilism since the 11th century (Korniichuk et. al. 2001). A distinct focus on market theory naturally emerged during the 17th-19th century industrial revolution, coinciding with the establishment and proliferation of the fundamentals of the modern capitalist Anglo-Saxon economy. In the theoretical aspect, classical political economy and neoclassicism as its further retrospective branch became the expression of the above-mentioned.

The basis of the methodology of modern understanding of the role of market and market relations is presented, first of all, in the works of (A. Smith 1994), D. Ricardo and

other representatives of classical political economy by the ideas about the naturalness of relations between people based on the free exchange of goods and services as the most effective economic system under the condition of minimizing regulations. It should be noted that since that time market has been considered as a macroeconomic value.

Instead, during the following centuries the main debates were about the so-called «law of markets» interpreted by (J.B. Say 1821), who transformed this idea into a concept of the market as the most perfect economic mechanism; at the same time, such a mechanism has the ability to self-adjust, self-develop under the conditions of sufficient economic freedom in society, which is at the same time a guarantee of solving any economic or other problems. At the same time, this law emphasized the role of the monetary system in interpreting quantitative theory of money, as well as other factors of formation and restoration of the market balance – first of all, the ability of the market to facilitate almost instantaneous reaction of agents to changes in the economic situation. This should be added the thesis about the role of market balance - the ratio between demand and supply, which determines the perfection of the market in the interpretation of (L. Walras 2013) and others, where the criterion of «market balance» can be associated with a certain standard of the state.

Critical views on this point of view were expressed by (K. Marx 1976), (Hebert et. al. 1992); (Sismondi et. al. 1991); (Proudhon 1840) and others. In the broadest interpretation of their perspectives, the market and the capitalist system are envisioned to be inevitably destined for a state of crisis. This predicament arises from the inability to realize the produced goods fully, as outlined, owing to the inherent asocial nature of the system. It is also appropriate be clarify the position of the «German historical school», an economic trend that in the 19th century accused political economy of cosmopolitanism, ignorance of the national peculiarities in favour of social and cultural values, exaggeration of the role of the factor of behaviour of an «economic man», etc. (Korniichuk et. al. 2001). Modern nationalist trends in the market organization are often based methodologically precisely on these positions.

Fundamental correction of the market theory took place in the 1930s, after reconsideration of the essence of capitalism as a result of the Great Depression. The theories of monopolistic and imperfect competition by (E. Chamberlin 1951) and (J. Robinson 1979), which refuted the concept of free competition and at the same time forced a completely different look at the reality of the market and competitive environment, should be attributed to this period. In the future, Say's law of markets was critically reconsidered by (J.M. Keynes 1964), who developed his theory refuting the idea about natural perfection of the market as an economic mechanism. The main thing was that both of these approaches logically led to the conclusion about the need for regulations, and this was precisely what determined the new economic doctrine of the 20th century.

A certain compromise between Keynesian theory and the principles of economic liberalism was achieved in the second half of the 20th century by the formation of theories of neoliberalism (monetary, ordoliberal, etc.), according to which regulations were recognized as necessary ones to some extent precisely for the purpose of protecting competition.

Historically, there was also formed a separate institutional approach to defining the essence of the market as a separate social institution, i.e. a set of norms, rules (formal

and informal), habits that were formed in society over a long period. The works by (W. Mitchell 1927) became the most economical in this sense. However, this undoubtedly original methodology regarding the logic of process cognition is unlikely to have fundamentally changed the idea of the laws of the market. The summarization of key concepts in market theory is presented in table 1.

Table 1. Historical and conceptual phases in the development of contemporary market theory

Historical stages	Basic idea	Modern perspectives on conceptualizing the idea
1	*2*	*3*
The theory of mercantilism XI-XVII centuries	1. A pivotal role played by commerce, along with the significance of gold and jewels (currency). 2. The necessity for state protectionism, coupled with the attainment of a favorable trade balance at the individual country level.	Endowing the monetary system with distinct and specialized functions, the justification for regulatory policies, state protectionism, and the pursuit of a positive trade balance. These principles found expression in specific tenets of neoliberal monetary theory, nationalist interpretations of market models, and government regulation.
Classical political economy of A. Smith and his followers in the 19th century (D. Ricardo et al.)	1. Viability of structuring society on the principles of free market exchange within the framework of economic liberalism, where motivations stem from the inherent inclination of individuals toward economic self-interest. 2. Quantity theory of money.	Theories of economic liberalism and neoliberalism; assigning «technical functions» in market exchange processes to the monetary system; emphasizing the significance of the competitive environment factor in market exchange processes.
Say's Law Markets (L. Walras et al.)	The primary function in the structuring of the market lies in its capacity for self-adjustment and self-improvement through internal mechanisms and a well-constructed monetary system. This system is aligned with monetary policy and technical functions that facilitate communication between supply and demand.	Significance of the mechanisms within the global market economy, along with a well-calibrated monetary policy and a validated monetary system. The concept revolves around sustaining the optimal state of the market based on the demand-and-supply ratio criterion.
The stage of criticism of the market laws of political economy	Significance of the factor of imbalance between supply and demand, the distribution of added value, incomes across various classes, and the nature and periodicity of economic crises, among other considerations.	The distribution of added value, incomes among participants in market relations, the involvement of classes and social groups in production and appropriation processes, and the redistribution of profits from exchange constitute elements that have been mirrored in specific aspects of interpreting the principles and criteria for the efficiency of market exchange.
German historical school (D. F. List and others)	The need for state protectionism, consideration of national characteristics, values of the social level, etc.	The necessity to consider the condition of distinct national economies and specific non-economic factors.
The theory of institutionalism (W. Mitchell et al.)	The market is just one of several social institutions and not the primary determinant of economic relations in society. In reality, individuals do not operate based solely on market expediency but rather in alignment with the norms and traditions of society.	The role of non-economic factors in consumption (nature of demand), spending and income formation.
Theories of monopolistic and imperfect competition (E. Chamberlin, J. Robinson)	Rationale for genuine competition in the form of monopolistic and imperfect competition. The necessity for regulations to	The pivotal role of a competitive environment. The requirement for regulations to safeguard competition. These principles were incorporated into the

	safeguard competition and restrict a monopolistic state within the market.	theories of neoliberalism and Keynesianism.
Keynesian theory (neo, post-Keynesian theory) (D.M. Keynes et al.)	Market is not perfect and needs regulation. Demand lags behind supply and needs separate stimulation. The expediency of stimulating employment (rates of economic growth) due to the stability of the monetary unit.	The doctrine of regulations in order to ensure employment (rates of economic growth), ignoring the role of stability of the monetary system This constitutes an independent contemporary theory regarding the government's regulation of the economy.
The theory of neoliberalism (M. Friedman, F. Hayek, L. Mises et al.)	Confining the regulatory ideology solely to the function of safeguarding the competitive environment.	Affirmation of the utmost significance of competition and a stable financial and monetary system. This represents an independent contemporary theory of government economic regulation, primarily focused on monetary theory.

Source: developed by the authors according to the references

Therefore, modern interpretation of the market in one way or another is methodologically based on the discourse of provisions formulated historically in the relevant theories, approaches, and scientific schools (Table 1). In each case, there can be observed a specific interpretation of the essence of the market and factors that determine it; in each case, the emphasis is made on special cause-and-effect relationships of the market as a system. Emphasizing once again the absence of a complete and reliable (i.e. acceptable to all parties to the dispute) modern theory of the market, interpretation of the latter cannot ignore the mentioned views, regardless of the viewpoint of the public analyst-practitioner who tries to contribute to the creation of a market that would mostly meet the society's demands.

In general, the approaches mentioned above make it possible to distinguish the following market theory components including statements, provisions, factors: regulations, monetary system, the concept of economic liberalism (feasibility of non-interference of the state in the economy, free trade, pricing and competition), competitive environment, balance between supply and demand, nature of the distribution of added value and income/benefits of market players, non-economic factors (national, psychoethical, etc.), employment (rates of economic growth). We posit that it is feasible to delineate the model of the global market by examining the substantive aspects of the specified factors (Lohosha et. al. 2020); (Lohosha et. al. 2019).

Simultaneously, the following aspects persist as subjects of considerable debate: 1) the nature of state regulation (its appropriateness, boundaries, forms, etc.); 2) the definition of a perfect/imperfect competitive environment by the state. 3) the role of money (quantitative or monetary interpretation); 4) fairness of market exchange; 5) limits of economic freedom, etc. And the most important point refers to defining the model of the market functioning, its characteristics that would become socially acceptable (obviously, the latter comprises the essence of the terms «efficient» or «perfect market»).

To answer these questions, we offer a mathematical expression of the market model, the so-called «market formula» (authors' term). The fundamental concept behind this formula rests on asserting the decisive influence of two market factors, namely supply and demand (1):

$$M = S/D \quad (1)$$

where, *M* – market that is considered in its optimal (efficient, perfect, socially recognized) state;

S – supply, which is one of two determining factors of the market, which represents business activity in the production of goods necessary for society;

D – demand, which is considered by the totality of society's needs (potential demand) and its purchasing power (solvent demand).

Interpretation of both supply and demand requires specific detailing, first of all, of how the main two factors, i.e. demand and supply, are mathematically correlated in this formula. In this mathematical expression (1) (supply-to-demand ratio), market is a mechanism of the post-industrial civilization of mass consumption, when the market is limited to consumption; historically, this is the period of the last – conditionally – 100 years. The opposite one (2) (demand-to-supply ratio) represents characteristics of the market of the traditional poor society, which took place in the millennium before the 20th century, when the market was determined by the possibilities of supply, i.e. production of goods.

The specified supply-to-demand ratio (1) reflects the essence of the market: demand is conditionally objective, while supply is demand-oriented. The balance between supply and demand will take place when the value of (1) is close to 1.0 relative units, i.e. business (supply) provides demand (society) with necessary goods in terms of quantity, quality, assortment and nomenclature. In the economic context of the formula, we are referring to supply that is oriented toward solvent demand, and as such, it should naturally develop within this economic system. Substantial deviations from 1.0 signal an economic crisis (either scarcity or overproduction) with all the ensuing repercussions mentioned earlier. The coefficient ratio of 1.0 is established through monetary assessments of demand and supply, thereby ensuring a universal interpretation of the magnitude (value) of any market. It is not difficult to demonstrate an easy technical possibility to quantitatively assess the size of the market, e.g. based on the needs for the consumption of vegetables etc.

The «market formula» is an author's analytical model for displaying the functional and effective impact of the main factors that determine market efficiency and its management algorithm.

The authors of the article summarized the scientific approaches to the interpretation of the essence, determining factors and logic of the evolution of the market theory based on the concept of the post-industrial market, which are based on the laws and regularities of market development, its functions, principles, priorities, organizational and economic mechanisms for ensuring the implementation of development goals and objectives. This makes it possible to determine the socio-economic consequences of the systemic influence on the key elements of the market mechanism - supply and demand, competition, pricing, infrastructure, the nature of state regulation, etc.; at the same time, the author's approach to the interpretation of the post-industrial market is based on the ascertainment of the determining role of the main market factors (demand and supply) under the conditions when the system of market relations tends to the greatest effectiveness, the lowest costs, which in aggregate ensures proper motivations for entrepreneurship, maintaining a socially acceptable level of income , wages, as well as

agreed with other restrictions and parameters.

On the other hand, expression (2) unveils the concept of the potential for the so-called «optimal» demand value. This hinges, firstly, on the potential needs of society, which can be considered relatively biological or objective, and secondly, on the aforementioned solvent demand. The economic system is structured in a manner where the objective demand will consistently surpass the ability to pay. The ideal (optimal) state of demand is perceived as the position where solvent demand is maximally aligned with the objective demand. Any excess beyond this point is explained by the absurdity of the Veblen effect, applicable to only a very limited portion of society. Consequently, the system's objective is not merely to expand the market, but to minimize its technical characteristics to the optimal value, maintaining a demand-to-supply ratio under 1.0. This is achieved under the condition of maximizing the supply of demand, while the growth of the market is interpreted functionally as the process of societal needs expansion. In most cases, the latter is obviously limited by physiological needs, i.e. markets in these cases have, relatively speaking, the limit of rationality.

$$\begin{matrix} & D_1 \\ & \rightarrow \\ & \text{opt} \end{matrix}$$
$$D \quad Opt \quad \left\{ \begin{matrix} D_2 \\ \rightarrow \\ \max \end{matrix} \right. \qquad (2)$$
$$\begin{matrix} D_2 \rightarrow D_1 \\ \max \end{matrix}$$

where, D_1 – demand, which is considered by the totality of society's needs (potential demand);

D_2 – solvent demand.

Despite its apparent simplicity, the ratio in (1) is augmented significantly by incorporating factors into the formula that exert a functional influence, either directly or indirectly, reinforcing or limiting each other. This influence can be mathematically expressed as a coefficient ranging from 0.0 to 1.0 in relation to the resultant indicator (3).

$$M = S/D * S_R * S_{CE} * I_M * M_S * Cn(m)cte \qquad (3)$$

where, S_R – state regulation, which can hypothetically promote or limit the degree of market perfection (analogous to the indicators of formula (2) given below);

S_{CE} – state of competitive environment;

I_M – infrastructure of the market;

M_S – monetary system;

Cn(m)cte – critical number (mass) of capitalist-type enterprises.

Conditions of the market optimization are shown in (4)

$$M_{opt} \begin{cases} S/D \rightarrow 1.0 \\ M_S \rightarrow opt \\ S_{CE} \rightarrow max \\ S_R \rightarrow opt \\ I_M \rightarrow opt \\ Cn(m)cte \rightarrow opt\ (1.0) \end{cases} \quad (4)$$

In accordance with (4), the so-called optimal state of the specified market factors can be defined, which mathematically reflects the extent of their contribution to achieving a supply-to-demand ratio close to 1.0 (attaining market balance).

Modeling supply and demand constitutes essentially a unified task given the interdependence of the quantities involved. However, certain constraints can be categorized concerning supply and demand separately.

Hence, forecasting demand is considered a less challenging task. The objective demand can be represented by a set of essential goods within reasonable limits. The complexity of modeling, at the same time, revolves around the formation of acceptable solvent demand both in general and for each individual, primarily contingent on the efficiency of the financial and monetary system. Technically, modelling of the offer is a more difficult task. For this purpose, the following set of conditions is proposed (5).

$$S_{d\,opt} \begin{cases} Pp \rightarrow max \\ Rr \rightarrow max \\ Pc \rightarrow min \\ AV \rightarrow max \\ Wg \rightarrow max \\ RE \rightarrow max \\ ME \rightarrow max \end{cases} \quad (5)$$

where, Pp – profitability of production (business);
Rr – rate of return;
Pc – production (business) costs;
AV – added value;
Wg – wages;
RE – resource efficiency;
ME – motivation for entrepreneurship

In this case, generally recognized economic indicators are provided (1-5). Consequently, the proposed market formula posits the following: the system (business) should strive for optimal efficiency and minimal costs, which, in aggregate, will ensure sufficient motivation for entrepreneurship while maintaining a socially acceptable level of income for the majority of society in the form of wages. Manipulating values within the specified limits in each specific case will result in an individual scenario. However, the operational logic of the system remains quite typical.

The interpretation of the proposed mathematical framework for managing the representative market enables the identification of a set of criteria and indicators to describe its state (Table 2).

Table 2. Attributes of the global market

Groups of criteria	Criteria	Indicators	Indicative role of the indices
	Market size	Cost (estimate of demand, supply) in monetary units/physical quantities.	Maximization of demand to objective values and optimization of supply under purpose of balance of values of about 1.0.
Cost effectiveness of the market	Economic efficiency of the market	Amount of added value. Rate of return. Business profitability (production). Production costs. Correspondence of the financial and monetary system and market infrastructure.	Alignment with the operational logic of any economic system.
Sociality of the market	The level of socio-economic segregation of the main groups of agents - participants in market relations Social efficiency of the market. Environmental efficiency of the market.	A gap between objective and solvent demand. Salary level. Number of jobs. Motivation for entrepreneurship, work, cooperation, corporatization of the system of relations, etc.	Support of acceptable social standards. Motivating all market players. Correspondence to the logic of functioning of any economic system
Regulativeness of the market	The level of the market liberalization. The state of competitive environment. The degree of intervention in the market.	The extent of market limitations (entry barriers). Preservation of competitive conditions. The degree of protective measures. The extent of corruption. The degree of identification and limitation of opportunistic behaviour of market participants. Effectiveness of the market monitoring system (data collection, accuracy in analysis, and regulatory decision-making). Extent of political/clan influence on the government.	Functional impact of the regulation factor on socio-economic indicators of the market system

Source: result of authors' research

In terms of numerical data, Table 3 illustrates the factors influencing the establishment of the universal market, using Ukraine's vegetable market as an example. This table gives all possible statistical data and their interpretation based on the traditional modern information field. It represents the dynamics since the beginning of the 90s of the 20th century, which provides an idea of market changes. The authors' vision of the benchmark of the market, which can be conditionally defined as a post-industrial model, is also highlighted.

Table 3. Dynamics of vegetable market indicators in Ukraine during the period of market reforms

Indicators	1990	2000	2010	2015	2022**	Prospective model
Cropping areas under vegetables, thousand ha	456	538	462	440	378	550
Production of vegetables, mln t	6.67	5.82	8.12	9.21	9,89	12.65

Yield, t/*ha	0.15	0.11	0.17	0.21	0.21	0.23
Profitability of production of open ground vegetables, %	28.0	-1.7	23.5	47.5	33,2	75.0
Average selling prices of vegetables*, (domestic prices)	208.1 181.1	572.1 105.2	2,551.6 323.4	3,903.4 144.1	14,025.0 359.6	4,380.5 175.2
World selling prices of vegetables, USD/t	…	…	…	205.4	229.8	238.5
Market value, mln UAH	1,242.4	2,774.9	17,427.4	28,690.0	91,675.5	41,614.8
Market value, mln USD	1,081.2	510.2	2,208.8	1,059.1	2,352.9	1,664.6
Potential market value, USD	…	…	…	1,519.9	2,567.3	2,265.7
Ratio of the main producers of vegetable products (share of agricultural enterprises and households, %)	27/73	25/75	20/80	15/85	16/84	60/40
Channels of sale of vegetable products (to processing enterprises, on the market and through other channels)	89/8/13	13/47/40	37/12/51	47/4/49	51/3/46	60/30/10
Consumption of vegetable products per person, kg	128	118	177	161	164	250
Export, thousand tons	274	30	335	315	303	700
Import, thousand tons	45	29	311	240	270	150
The level of state regulation	high	low	low	low	low	low

Notes: * in the numerator – UAH/t, in the denominator – USD/t (price in USD – according to the NBU exchange rate in the specified period);

** – taking into account the state of war in Ukraine.

Source: authors' research based on statistical data and their own predictive models

Evaluating the dynamics of market indicators of vegetable products in Ukraine, the research algorithm should be conducted according to the following characteristics of this market:

Assessment of market efficiency/perfection. Considering the ratio of the indicated figures (Table 3), the lack of sufficient information, which allows us to make a reasonable assessment of this market, should be considered as a very important problem issue. This applies primarily to the block of indicators regarding both market sociality and market economy, where it is problematic to determine the distribution of added value between the main groups of market agents.

Peculiarities of functioning of the market of vegetable products in Ukraine. When analysing this market, the problem of quasi-openness (author's term) should be treated the main modern one (however, inherent in all the indicated stages). This means the following: market operates *as if* in the conditions of an open economic space and free trade, but the existing mechanisms create the effects of underestimating real prices of products, added value, wages, incomes and profits of all participants as a result. The situation should be recognized as a typical one for the countries having transformational economy, where implementation of market relations continues against the background of accompanying dysfunctions. This happens in conditions of exceptionally low purchasing power demand, especially in the off-season, when the cost of products objectively increases.

The level of economy and sociality of the market of vegetable products in Ukraine. As a final result, when creating products comparable in efficiency and quality,

the market has a very low cost, and therefore economy and sociality, compared to the global counterparts.

Dysfunctionality of the market of vegetable products in Ukraine. At the same time, another negative effect is almost complete technical and technological dependence of the domestic market on the prices of current assets, which intensifies dysfunctions in general. In addition, due to the above-mentioned reasons, there is an unreasonably significant gap between an objective and solvent demand. All of the above indicates inability of the market in its current state to perform necessary functions.

The role and level of state regulation of the vegetable market in Ukraine. Hence, we consider that the role of regulations is primarily and mainly to stimulate real integration of the country's economy as a whole and the industry in particular into the international market. This involves a set of measures that would contribute to the equalization of prices, incomes, profits, wages, etc. to the world average. At the industry level, the main directions of state regulations should involve tax regulation and investment stimulation, which would contribute to increasing the efficiency of the industry's capitalization process.

5. Conclusions.

The contemporary intellectual framework of market theory employs a well-defined set of factors and models delineating their functional influence. Nevertheless, the development of a universally applicable market model remains a subject of ongoing scientific inquiry.

The evaluation of market model effectiveness necessitates a comprehensive and integrative assessment of the myriad factors and elements constituting this model. In a post-industrial context, the effectiveness of the market model presupposes maximizing benefits for all participants, considering various socio-economic indicators (such as job creation), profitability, and optimal satisfaction of needs. Approaching market functioning and regulation from an engineering perspective involves manipulating quantitative ratios based on predefined formulas and constraints. In totality, this reduces market management to a logically technical operation, the justification of which lies in the anticipation of a collective societal enhancement of market effectiveness.

The principles of state regulation of the market of vegetable products in Ukraine should be implemented in the direction of the formation of a separate, original concept of regulations, based on the use of a contractual approach (as internal mechanisms of agreement and coordination of the actions of economic agents of the market) and state regulations (as external tools for the formation of normative rules of behavior of market participants relations) to achieve an acceptable state of the market. In contrast to existing developments, this approach involves a conceptually new construction of a market development management system based on "socially determined liberalism" as an ideology of post-industrial development, modified from classical economic liberalism. This allows for the development of an algorithm for stimulating market entities with proven economic efficiency of such a behavior model.

We believe that market management, involving deliberate interventions in this institution, is simultaneously a straightforward and exceedingly intricate undertaking. The

complexity arises primarily from the necessity to adhere to the constraints and objectives of management (influence), precluding the inclusion of other motivations such as political, personal, economic, corruption, and so on. As a result, individuals responsible for market management should be part of an elite cadre of managers, with the theoretical framework of their activities rooted in the concept of a universal market model.

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