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METHODOLOGICAL AND THEORETICAL FRAMEWORK OF THE CONCEPT OF THE RESILIENCY OF SUPPORT SUBSYSTEM OF THE UKRAINIAN NATIONAL ECONOMY IN THE CONDITIONS OF SHOCK DISTURBANCE

The paper deals with the methodological and theoretical substantiation and practical verification of the feasibility of applying the concept of resilience to assess the impact of shocks on the supply subsystem of the Ukrainian national economy. The paper suggests that the supply subsystem of the national economy has resilience properties and can absorb shock disturbances through both static and adaptive mechanisms.

At the theoretical level of research, it was proposed to distinguish between the dynamic and static components of the resilience of the socio-economic system. It has been found that the ability of a socioeconomic system to absorb shocks after a crisis can be an innate or adaptive quality. It is proposed to understand innate resilience as a systemic ability to withstand crises. At the same time, a set of additional efforts or measures forms adaptive resilience and determines the ability of the socioeconomic system to maintain its own functioning in crisis situations.

It is shown that in the lack of adequate statistical information specifying the national economic output the empirical level of research can be based on quasi-indices of economic activity expectations. Based on this assumption, the study proposes the use of the business activity expectations index (BAEI) of the National Bank of Ukraine for indirect estimates of economic performance.

It is determined that in the conditions of military aggression of the Russian Federation, the national economy of Ukraine demonstrates a fairly significant static resilience with signs of relative recovery. At the same time, at the level of the supply subsystem, a trend of deployment of a long-term financial and economic crisis is being formed, both due to the loss of natural and produced capital, and the release of a significant amount of human capital from aggregate production. Medium- and short-term trends in the recovery of both business activity and the static resilience indicators are a sign of adaptive efforts on the part of the state and significant external financial support for Ukraine in 2022.

Keywords: *resilience, supply subsystem, shock disturbance, dynamic economic resilience, business activity expectations index, smoothed moving average.*

Formulation of the problem. The sequence of shock impulses caused by the military aggression of the Russian Federation has had a large-scale destructive impact on all spheres of public life - economic, social and environmental.

The war in Ukraine led to a profound in all areas of people's lives. In 2022, inflation will be above 30% (the growth in prices for medications, and personal care products sped to more than 16.7%) and GDP will decrease by a third. At the same time, the nominal incomes of households decreased from 25% to 50%. The recent Situation Report states that 17.7 million people are in need of humanitarian aid (Ukraine: Situation Report, 2022 [1]). The current situation has further deteriorated in October 2022 as essential civilian and energy infrastructure, residential buildings, public transport, water supply, and power networks have been damaged, leaving hundreds of towns and villages across the country without power and access to heating (Ukraine Situation: UNHCR Revised Supplementary Appeal, 2022 [2]) On September 9, the World Bank, the European Commission and the Government of Ukraine in cooperation with partners presented a joint report with an objective assessment of the needs for the reconstruction and recovery of Ukraine in the amount of $ 349 billion 9 (Ukraine Rapid Damage And Needs Assessment, 2022 [3]). Under such conditions, the country has been facing the task of stabilizing and ensuring its sustainable development in the post-war recovery as never before.

Analysis of recent publications. In recent years, academic, socio-economic and political research has increasingly used the term "resilience" - a definition intended to identify the response of an object or system to shocks or disturbances to equilibrium. Although this term has long been used mainly in ecology and psychology, it is now recognized in a variety of contexts as a subjective and mostly positive attribute of a system or as a desirable property to be reproduced or improved. Professor Adam Rose (C. Noah, N. Dormady, A. Rose, A. Henriquez, C. Blain, 2022 [4]) commenting on this property, noted that the idea of resilience as the ability to return to the previous state corresponds to the mainstream concept of self-recovering economic equilibrium. If the normal state of the economy (steady-state equilibrium or balanced growth) is disturbed by shocks of different genesis, adjustment mechanisms aimed at restoring equilibrium are automatically activated.

The definition of "resilience" has also become part of the categorical and analytical framework of economic research at different levels of localization. Research foundations and international organizations have proposed calculation methods for a city, regional and national resilience indexes. The most prevalent at the national level are the indexes FM Global Resilience Index (USA), Financial System Resilience Index (UK), Climate and Disaster Resilience Index (UN), at the level of individual territories and communities - Composite Resilience Index (Commonwealth of Australia), Rural Resilience Index (Canada), RIMA (EU), etc. At the same time, such a breakthrough in the practical use of the idea of socio-economic resilience has been ahead of the comprehension of the true content of this definition. The idea of resilience resonates with the growing importance of the evolutionary approach in economic research (N. Grazhevska, , 2008 [5], J. Helgeson, A. Roa Henriquez, 2022 [6], S. Chang, C. Brown, J. Handmer, J. Helgeson, Y. Kajitani, A. Keating, I. Noy, M. Watson, S. Derakhshan, J. Kim, A. Henriquez, 2022 [7], N. Dormady, A. Roa Henriquez, A. Rose, 2017 [8], N. Dormady, A. Roa Henriquez, A. Rose, 2018, [9], A. Rose, D. Wei, K. Byrd, R. John,

2021 [10], S. Carpenter, B. Walker, J. Anderies, N. Abel, 2001 [11]), namely with the acceptance that large shocks can have a decisive impact on changing the vector of development - the long-term trend of economic development over time. The results of the analysis of the reaction of socio-economic systems to shocks (Sv. Burlutskiy, S. Burlutskii, V. Margasova, 2019 [12], Sv. Burlutskiy, S. Burlutskii, T. Berezianko, 2019 [13], S. Burlutskiy, Sv. Burlutskiy, V. Margasova, 2017 [13]) determine its comprehension as a qualitative shift (negative or positive) in the development of the national economy. These qualitative shifts are based on the axiom: in every socio-economic system, regardless of the degree of its organization, over time, fluctuational inter-transformations are established in the process of exchange of economic activity and its results. Consequently, this behavior of socio-economic integrity determines the focus of our study on the phenomenon of resilience.

Unsolved parts of the problem. The fundamental difference in the understanding of sustainable development between the developed countries and Ukraine is the relevant conditions and focus of the concept. Taking into account the pre-war reference point, it should be noted that for developed countries the conditions of transition to sustainable development were highly efficient post-industrial production and almost maximum resource involvement, while for Ukraine these are outdated technologies and overall low efficiency of social production, low living standards, and imbalance of the credit and financial sector. In terms of the concept's orientation, the positions are more similar: the desire to ensure the safe existence of socio-economic national systems and to provide a sufficient level of well-being for present and future generations. After all, for developed countries, the issue of existence is in the plane where the limitation of needs and qualitative improvement of already quite efficient production are combined.

For Ukraine, this is the problem of restructuring an inefficient model of social production and the formation of an appropriate institutional superstructure. We consider that the proposed concept of resilience can become the scientific basis for the formation of new and improvement of existing tools to ensure a specific model of sustainable development in Ukraine. The formation of appropriate methodological support for the assessment of resilient processes and mechanisms of the national economy is a necessary stage in the development of a strategy for the country's economic recovery from the crisis and its further post-war sustainable development.

The purpose of the article is aimed at methodological and theoretical substantiation and practical verification of the feasibility of applying the concept of resilience to assess the impact of shocks on the supply subsystem of the Ukrainian national economy

Research methodology. In the process of the research, a set of general scientific, specific scientific methods were used: a systematic approach (to substantiate methodological approaches to the identification of resilience descriptors of the national socio-economic system); monographic (to determine the features of the implementation of evolutionary and technical approaches to socio-economic resilience); dialectical method and generalization (to reveal the essence of the definition of "dynamic" and "static" resilience"); analysis, synthesis, and deduction (to substantiate the concept of socio-economic resilience of the national economy supply subsystem); index method and moving average method for quantitative assessment of the dynamics of the national economy's supply sub-system output.

Research results. The general focus of the research is mainly to assess the parameters of the resilience of sustainable development of the supply subsystem as a basic component of the national socio-economic system. At the same time, sustainable development requires mandatory consideration of the parameters of the socio-institutional and ecological subsystem. The format of the research limits the possibilities for developing the author's methods for assessing the resilience of all predicates of subsystem localization. It would be logical to use existing methods and approaches to assess the state of the environment, social development, and quality of life. In previous scientific works, it was proved that at the current stage of development of the national economy of Ukraine, the most appropriate is the technocentric mechanism for ensuring the resilience of sustainable development aimed at implementing the model of "very weak sustainability". Thus, the parameters of the social and ecological components are as integral as restrictive. Therefore, at the first stage of the implementation of the Strategy for Resilient Development (post-shock stabilization stage), the dynamics of social and environmental indicators should not have a negative trend. At the same time, the parameters of the institutional environment should have a positive trend. The composition of such institutional indicators corresponds to the rating assessments of the Sustainable Development Strategy "Ukraine-2030". For a general quantitative assessment of the parameters of the social and ecological component, it is proposed to use the "Methodology for measuring regional human development" approved by the decision of the Presidium of the National Academy of Sciences of Ukraine and the Board of the State Statistics Service of Ukraine №123-m of 13.06.2012. It is advisable to use not an integrated index, but the components of human development: population reproduction, social status, comfortable life, well-being, decent work, and education. For the initial assessment of the ecological subsystem, it is possible to use the components of the integrated indicator of the state of the environment - indicators of the state of the land, water resources, and atmospheric air (Methodology for measuring regional human development (2012) [14]).

Special attention should be paid to the dynamic and static aspects of resilience in the corresponding predicate of temporal localization. In the static sense, economic resilience should be viewed as the ability of the socio-economic system to maintain its functions during a shock perturbation (S. Burlutska, 2015 [15]). Thus, the fundamental economic problem that is exacerbated in the context of a shock is the efficient distribution of resources. This aspect is interpreted as static, because it can be ensured without recovery and reconstruction, and concerns not only the current level of economic activity, but also the future trajectory of development. Another key feature of static economic resilience is manifested primarily in the aspect of aggregate demand and mainly affects the owners of input flows (consumers) rather than producers (suppliers). The ways of using available resources should be as efficient as possible. This is in contrast to the aggregate supply aspect, where, as a rule, restoration or reconstruction of key inputs is required. Thus, static resilience should be considered mainly in terms of channels of aggregate demand and final consumption.

A more general understanding of the problem incorporates the dynamic aspect and is associated with dynamic economic resilience - the speed of recovery of the socio-economic system from a shock to the target state. In this understanding, the phenomenon of system stability comes to the fore, which reflects the ability of the system to return to a certain "norm".

This interpretation of elasticity is more complex, as it involves the analysis of long-term investments related to recovery and reconstruction, which are post-shock processes.

Dynamic resilience refers to post-shock conditions and reactions and determines the timing and cost of overcoming the consequences of the shock. Pre-shock measures related to static resilience, on the contrary, are aimed at reducing possible losses by neutralizing such losses. Another way to identify the specifics of dynamic resilience is that it is a flow characteristic of economic output over a given period of time. Hence, static resilience, respectively, is a characteristic of a stock. Thus, the static resilience of fixed capital (infrastructure) is related to the ability of "stocks" to absorb shocks (e.g., to maintain functionality in the face of destructive shocks or in the absence of additional investment) and is best illustrated by the terms "resistance or robustness".

The phenomenon of static and dynamic resilience is related to the horizon of the analysis: a short-term and long-term perspective. In the short run, at the level of an individual business or organization, some productive inputs are fixed, while in the long run they are variable. A constant input is usually fixed capital, because it takes time for its value or quality to change significantly. Variable inputs are primarily labor, natural resources and intermediate goods (their value and volume are quite volatile in the short run).

In the short run, there may be a situation of unchanged input flows (even labor or material), which is characteristic of static resilience with unchanged technologies and the use of existing resources with maximum efficient returns. Dynamic resilience changes the productivity of all inputs by increasing the production capacity and, therefore, corresponds to the long-run perspective. Thus, an increase in constant (fixed) inputs reduces the resiliency of the system and the likelihood that the socioeconomic system will reach a marginal level of efficient resource allocation.

In general, it should be noted that the strategy of static resilience should be aimed at reducing losses from shocks, and the strategy of dynamic resilience should accelerate the process of recovery of the socio-economic system.

The socioeconomic system's ability to absorb shocks or accelerate recovery from a crisis can be an innate or adaptive quality. Innate resilience refers to the general capacity to withstand crises (e.g. the capacity of individual firms or industries to substitute resources and goods, or the capacity of markets to redistribute resources in response to price signals).

Adaptive resilience implies the socio-economic system's ability to maintain its own functioning in crisis situations based on a set of additional efforts or measures. For example, protective functions can be strengthened after a shock by improving technology. Adaptive resilience has a lot in common with dynamic resilience and is related to the post-shock restoration (expansion) of the efficient production frontier, but, at the same time, it does not necessarily imply additional investments or expenditures. In accordance with the provisions given in the previous research papers (S. Burlutska, 2016, [16]), static resilience (RESstat) can be quantified as the ratio of the actual deviation of output (employment) as a result of a shock to the maximum possible fall:

$$RESstat = \frac{Vout_s - Vout_{\max}}{Vout - Vout_{\max}}, \quad (1)$$

Vout – actual pre-shock output of the system;

$Vout_{max}$ –the maximum possible drop in output (employment) of the system as a result of a shock and the absence of a resilient response;

$Vout_s$ –the actual fall in output (employment) of the system as a result of the shock and the static resilience strategy.

The shock impact on the socio-economic system causes a drop in output (employment) within the supply subsystem from the actual value of *Vout* to the level of *Vouts*, which is due to the existence of certain insurance stocks of input resources (Figure 1).

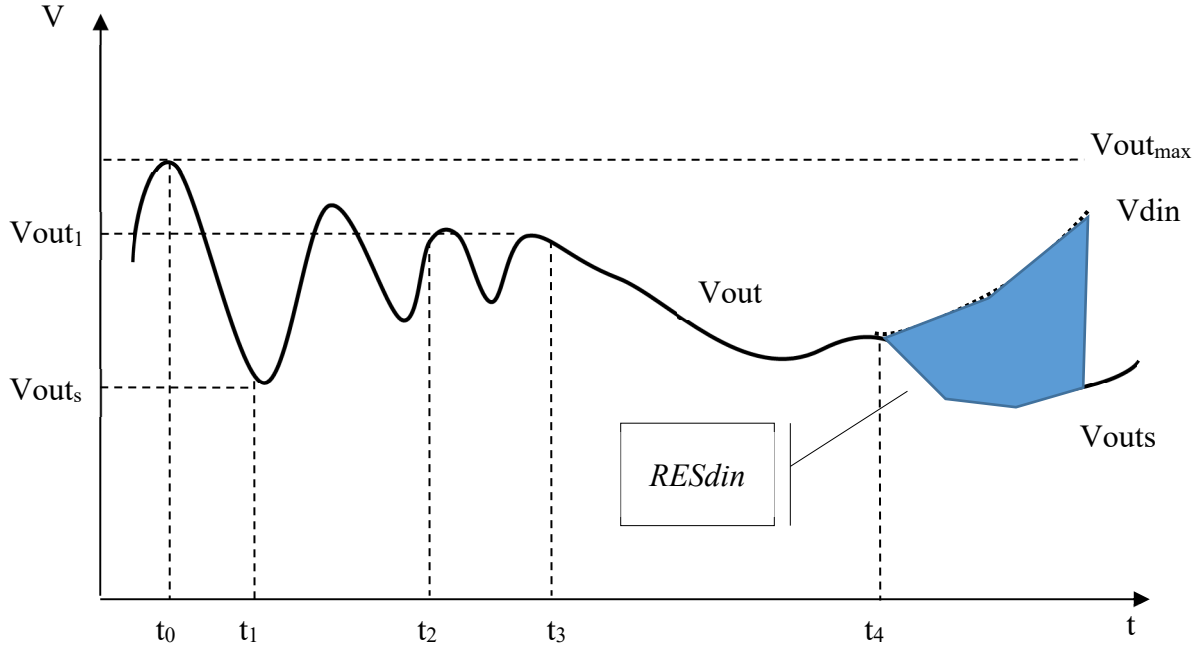


Fig. 1. Static and dynamic resilience of the supply subsystem under shock disturbance
Source: created by the authors on the basis of their own calculations

The potential fall to the level of $Vout_{max}$ is stopped by the inherent mechanisms of static resilience, which allow for a partial recovery of output (employment) in the period t_1 - t_2. Theoretically, the static resilience strategy can provide a return to the pre-shock parameters of the system, but this is true only for minor disturbances. In the case of significant, especially destructive shocks, the output $Vout_1$ can be achieved as the best version. Temporary balance in the time period t_2 - t_3 will lead to the exhaustion of static resilience reserves. The exhaustion is caused primarily by the action of price mechanisms: rising costs on the input side or rising prices and decreasing demand on the output. Hence, the vector of the post-shock output function is likely to be downward, and possible growth will depend only on the speed of the shock factors. At the same time, the transition to a dynamic resilience strategy can reduce the potential losses of the system.

It should be noted that in practice it is quite difficult to accurately separate the trajectories of dynamic and static resilience (see Figure 1), because output or employment indicators reflect the aggregate effect of both the factor of innate ability to withstand crises and adaptive mechanisms and levers. It would be more correct to attribute static resilience to short-term economic trends, and dynamic resilience to medium- or long-term processes caused by government intervention. It should also be emphasized that the quantification (formula 1) is

relative and depends on the starting point, namely the actual pre-shock output of the system *Vout* chosen for comparison.

In recent months, the national economy of Ukraine has been subjected to devastating shocks associated with the military aggression of the Russian Federation, which is manifested not only in the reduction of output, but also in the destruction of the country's infrastructure, loss of capital (natural and produced), human resources and the socio-economic system institutional matrix. The resilience assessment of the national socio-economic system in such conditions can become an effective tool for both forecasting economic dynamics and the formation of anti-crisis measures of public policy. Unfortunately, quantitative assessment of the economic situation by conventional methods in the current conditions is almost impossible. Given the situation that has developed in connection with the military aggression of Russia against Ukraine, the state statistics authorities are unable to collect and process quantitative indicators of the functioning of the Ukrainian economy. Under such conditions, a possible option may be to apply the business activity expectations index (BAEI), which is calculated monthly by the National Bank of Ukraine. The business activity expectations index (BAEI) is a tool for conducting the latest assessments and detecting trends in economic development. It is calculated on the basis of surveys of Ukrainian real sector companies.

Monthly business activity expectations indices are calculated on the basis of respondents' replies. These indices are as follows: sectoral indices (for each sector of the economy) and a composite index (describes the country's economic development over a month). A value of 50 corresponds to the neutral level. Index values above the neutral level indicate positive expectations (Monthly Business Outlook Survey. Official website of the National Bank of Ukraine, 2022, [17]).

The diffusion index (DI) is calculated as the sum of the percentage of positive replies (indicates an increase) and half of the percentage of neutral replies (indicates no change), using the following formulax

$$DIj = (P * 1) + (E * 0.5) + (V * 0), \quad (2)$$

where P is the percentage of respondents that reported an increase (optimistic views);

E is the percentage of respondents that reported no change:

N is the percentage of respondents that reported a decrease (pessimistic views).

Provided that P+ E + N = 100

BAEI is a weighted average indicator that is calculated on the basis of each sector's share in the weight structure.

The application of the proposed index does not methodologically contradict the concept of resilience, because in quantitative terms it reflects the expectations of economic entities regarding the direction of economic dynamics. The results of the relevant calculations are illustrated in Fig. 2.

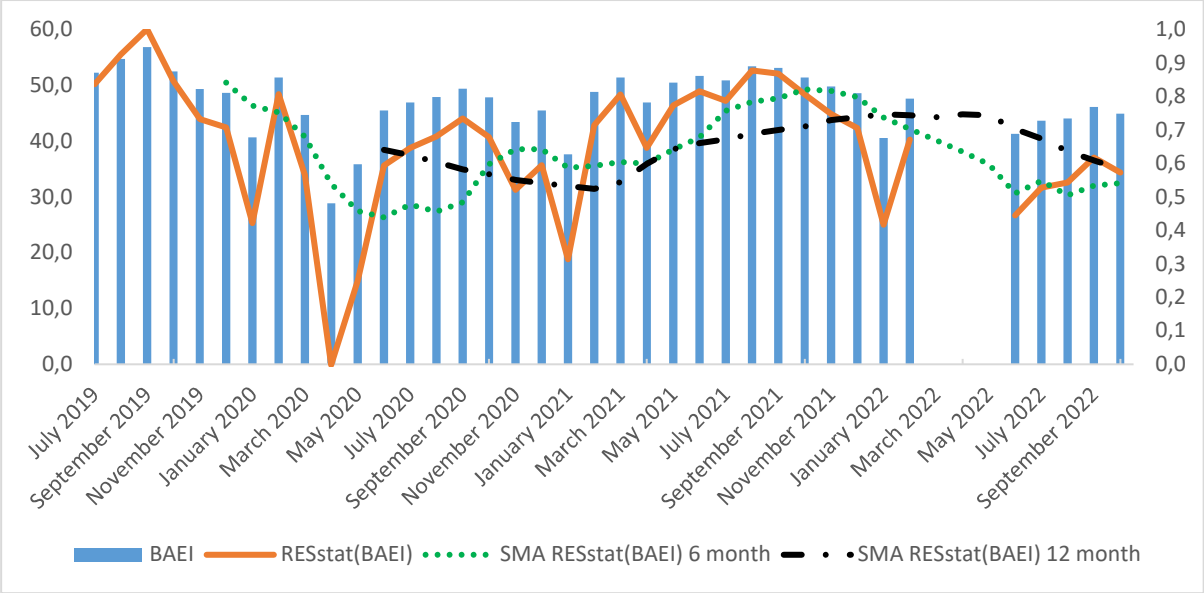


Fig. 2 The static resilience of the supply subsystem of the national economy of Ukraine under shocks in 2019-2022 (indirect estimation by the BAEI index)

Source: created by the authors on the basis of their own calculations

The maximum BAEI value for September 2019 was chosen as the actual pre-shock output of the system *Vout.* The maximum BAEI value for September 2019 was chosen as the actual pre-shock output of the system. This period corresponds to the one-unit value of the static resilience *RESstat* (BAEI). If we do not take into account the influence of seasonal cyclicality, the static resilience dynamics clearly indicate the shock impact of COVID-19. Thus, the smoothed moving average (6-month period) SMA_RESstat (BAEI)_6month demonstrates a persistent decline until June 2020 with a maximum drop in the level of the static resilience to zero (May BAEI level of 35.9 units). According to respondents' expectations during this period, 50% of respondents believed that the volume of industrial output would decline, and 23.3% of experts pointed to a potential reduction in the number of employed persons.

In the following periods, there was a gradual recovery of the trend of positive expectations to the level of 80%-90% of the pre-shock level. Accordingly, in September 2021, only 21.6% of respondents considered that the volume of industrial production would decrease, and 12.9% of experts pointed to a potential reduction in the number of employed persons.

A longer-term estimation based on the smoothed moving average SMA_RESstat (BAEI)_12month indicated the start of the recovery of the supply subsystem from March 2021. The dynamics of this SMA correlate quite well with the growth rate of GDP per capita, USD. Thus, according to the World Bank, the growth rate of the national economy of Ukraine in 2019-2020 decreased by 15.61% compared to 2018-2019. But already in 2020-2021, the growth rate exceeded the pre-crisis growth rate by 12.29%. In fact, this is evidence of a transition to a more resilient development trajectory after a shock. In this context, it is advisable to move to dynamic or adaptive system resilience.

The dynamic resilience (*RESdin*) can be quantified as the reduction in aggregate losses as a result of the implementation of adaptive measures to restore output (employment) compared to the actual value determined solely by static resilience:

$$RESdin = \int_{t_4}^{\infty} (Vdin - Vouts)dt, \quad (3)$$

where *Vouts* is the output (employment) function determined solely by static resilience; *Vdin* is the output (employment) function determined by the implementation of adaptive measures.

Thus, the faster the socio-economic system shifts to the dynamic resilience strategy after time t3, the less output (employment) losses it will have to face. We should also not forget about the social consequences associated with output losses - an increase in the social burden on the financial system, a reduction in public welfare, etc (S. Burlutski, Sv. Burlutski, 2015, [18]). Another argument in favor of the mandatory transition to the dynamic resilience strategy is the recursive nature of resilient processes: any measures to adapt the system to post-shock conditions of functioning form the future basis of static resilience, which in turn makes the trajectory of future development more sustainable.

The positive development trend of the system of supporting the national economy of Ukraine was completely destroyed by the military aggression of the Russian Federation. Unfortunately, the available data do not allow us to estimate the shock depth (Fig. 2), which was caused by the impossibility of collecting information to calculate the BAEI index during March-May 2022. But the smoothed moving average (6-month period) SMA_RESstat (BAEI)_6month showed both a decline and a recovery compared to 2020. Taking into account the events of the first half of 2022, this could be interpreted as evidence of a fairly high level of the national economy's resilience. However, the 12-month smoothed moving average SMA_RESstat(BAEI)_12month demonstrates a decline rate higher than in 2020-2021, which is a threatening indicator of the exhaustion of innate and adaptive sources of support for the resilience of the supply subsystem of the national economy. Quite indicative of this aspect is the assessment of employment in Ukraine. For the reasons mentioned earlier, there are no official statistics on the dynamics of the unemployment rate for 2022, but surveys of non-governmental organizations show (Fig. 3) that the situation is rather disappointing.

According to the Gradus surveys, the share of the unemployed has remained practically unchanged since May – about 34% of respondents; the number of working people is growing moderately at the expense of those who had a job but did not work. However, the share of those who have lost their jobs since the full-scale invasion has remained virtually unchanged at around 30% unemployed from May to September 2022. (Migration and Socio-Political Attitudes During Russia's Full-scale War Against Ukraine, 2022, [19]).

Those respondents who have a job but do not work can also be considered as actually unemployed. According to available data, 50% of the able-bodied population of Ukraine is excluded from the process of social production. Without considering changes in labor productivity, we should expect a corresponding 50% drop in the national product. Based on this, we would expect the formation of a downward trend in the static resilience curve not only according to the 12-month smoothed moving average, but also according to the SMA_RESstat (BAEI)_6month moving average.

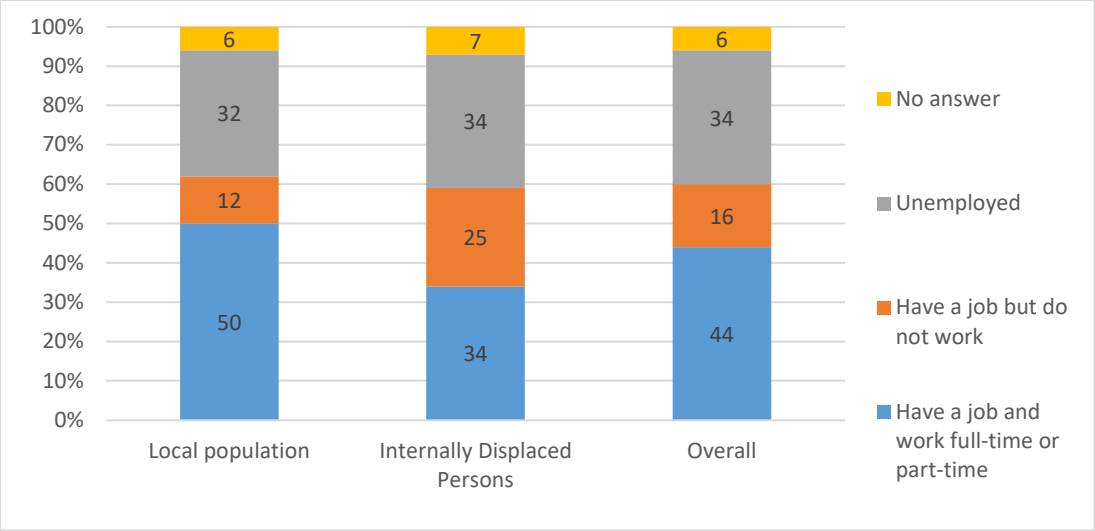


Fig.3 Assessment of employment of labor resources
Source: created by the authors on the basis of their own calculations

However, starting from July 2022, this smoothed moving average shows not only stabilization but also certain growth rates. A comparison of the above facts makes it possible to assert the real manifestation of the effect of the dynamic resilience caused by both anti-crisis actions of the state and external financial support of the Ukrainian national economy. In this way, according to the results of the analysis of the implementation of the state and local budgets for 9 months of 2022 (I. Onyshchuk, 2022 [20]), the state budget of Ukraine received more than UAH 320 billion in the form of international grants/gifts (25.6% of the total revenue of the state budget), which potentially allowed to fully cover the financing of the entire social sphere for the same period (the corresponding expenditures amounted to UAH 312 billion). It is clear that in the current conditions, most of the budget expenditures are directed to defense (UAH 700.6 billion for 9 months of 2022), and therefore the stimulating and multiplicative effect is realized to a much lesser extent than under normal conditions.

The results of previous studies actualize attention, especially on the issue of defining and measuring regional socio-economic resilience (S. Burlutska, 2015 [21], S. Burlutska, 2016 [16]). The importance of this issue is enhanced by the current trends towards decentralization of power, financial resources, and the growth of powers of territories and communities. If the phenomenon of regional resilience is necessarily considered in the context of dependence on the location of the region or territorial unit, is it possible to formulate common principles for defining, measuring, and explaining this phenomenon?

Firstly, territorial socio-economic formations are composite complex systems formed of numerous heterogeneous firms, workers, and institutions connected by complex links and relationships between each other and the external environment. All these components differ from each other by the degree and ability to absorb and adapt to shocks, by the ability to reorient their activities within regional (territorial) restrictions, and by the availability of resource sources. Thus, the regional or territorial level of response to shocks is the result of the emergent summation of discrete responses of these heterogeneous socio-economic agents, which further complicates the analysis. Such heterogeneity increases the probability that resilience parameters will differ not only for firms or workers but also within different firms and different workers.

Secondly, there is a rather large differentiation in the factors of regional socio-economic resilience. Undoubtedly, there are certain universal basic factors and mechanisms, but they act differently depending on the regional context, which is due to the significant heterogeneity and specificity of the components of regional systems. We have proposed several most determinant groups of possible factors (S. Burlutska, 2016 [16]). But their impact may vary not only from one region to another, but also from one type of shock to another. For example, in one particular spatiotemporal dimension, economic specialization could be a factor of dynamic development, and hence a source of resilience; but in another case (in the case of a shock), it would be transformed into a destabilizing factor. In addition, regional economic resilience is formed under the influence of conditions and limitations of the external environment. Regional socioeconomic systems do not exist in isolation, so the influence of other systems - other regions, the state in general, and the world economy - cannot be ignored.

Thirdly, the concept of resilience should be considered in the historical and evolutionary context. This is determined by the dynamism of the interaction of a set of aspects: vulnerability, elasticity, resiliency, and recovery ability. These parameters are formed under the influence of the previous development path of the region and, in turn, determine the further vector and dynamics of the socio-economic system. The recursiveness of such interdependence has specific features for each individual region. It is clear that the historical context is one of the determining factors in the evolutionary trends of, for example, the eastern and western regions of Ukraine.

Finally, the nature of the shock is crucial for assessing the resilient response of the region. Examples of such shocks are significant fluctuations in commodity prices (oil), unexpected changes in the central bank discount rate, sudden technological improvements, cycles of optimism/pessimism of investors and consumers, natural disasters, and terrorist attacks. It is the latter type of shock - (full-scale aggression of the Russian Federation in Ukraine with conditional localization in the central, eastern, and southern regions) - that is the determining driver of the post-war socio-economic processes in Ukraine both in the short and long term.

Conclusions. The analysis of the obtained results allows us to form a set of conclusions:

In the static sense, economic resilience should be viewed as the ability of the socio-economic system to maintain its functions during a shock and is related to the ability of "stocks" of all types of capital to absorb shocks and is best illustrated by the terms "resistance or robustness". The measure of static resilience is the degree of reduction in output or employment of an economic system.

Dynamic resilience should be considered as an adaptive characteristic of economic systems, which implies the ability of national economies to maintain their own functioning in crisis situations based on a set of additional efforts or measures. The measure of dynamic resilience should be considered as the potential reduction of aggregate losses as a result of the implementation of adaptive measures to recover output (employment) compared to the actual value caused solely by static resilience.

It is proved that in conditions of limited access to statistical information, quasi-indices of economic activity expectations (for example, the BAEI index of the National Bank of Ukraine) can serve as a basis for the analysis of static and dynamic resilience. The correlation of

medium- and long-term moving indexes of the static resilience with the dynamics of GDP per capita is the evidence base for this statement.

It is determined that in the conditions of military aggression of the Russian Federation, the national economy of Ukraine demonstrates a fairly significant static resilience with signs of relative recovery. At the same time, at the level of the supply subsystem, a trend of deployment of a long-term financial and economic crisis is being formed, both due to the loss of natural and produced capital, and the release of a significant amount of human capital from aggregate production. Medium- and short-term trends in the recovery of both business activity and the static resilience indicators are a sign of adaptive efforts on the part of the state and significant external financial support for Ukraine in 2022.

Prospects for further research should be focused on expanding and detailing the evidence base and analytical support for the concept of static and dynamic resilience at the regional level. This is especially relevant in the context of the relative localization of hostilities on a regional basis. The analysis of regional resilience indicators should focus on determining the consequences of adsorption/elimination of direct and indirect losses as a result of military actions. Direct losses include the loss of market (goods and services) and non-market (human capital, ecosystems) values. Indirect losses, in turn, are not directly related to the destruction of assets, but are the result of the impact of direct losses on related markets and territories. In general, we consider it expedient to join the position of the US NAC on the aggregation of losses into two groups: loss of assets and loss of output (reduction of income flow). Further analysis should focus on: the direct shutdown of the business activities of agents in the territory of the destructive shock (including the closure of investments in the affected region, and subsystem); the destruction of assets of the economic unit, and the corresponding reduction in production; destruction of infrastructure (reduction of production under conditions of restrictions in resource supply or impossibility to sell products)

References

1. Ukraine: Situation Report, 12 Oct 2022 https://reliefweb.int/report/ukraine/ukraine-situation-report-12-oct-2022-enuk.

2. Ukraine Situation: UNHCR Revised Supplementary Appeal 2022. https://reporting.unhcr.org/document/3484.

3. Ukraine Rapid Damage And Needs Assessment. August 2022, the World Bank, Government of Ukraine, European Commission. https://www.minregion.gov.ua/wp-content/uploads/2022/09/ukraine-rdna_report_print.pdf.

4. Noah, C. Dormady, N, Rose, A, Henriquez, A, Blain Morin, C (2022) The cost-effectiveness of economic resilience. International Journal of Production Economics, Volume 244, https://www.sciencedirect.com/science/article/pii/S0925527321003479.

5. Grazhevska, N. I. (2008). Economic systems of the era of global changes: monograph. Kyiv: Znannya. 431 p.

6. Helgeson, J., Roa Henriquez, A. (2022). A Theoretical Framework for Supply Chain Resilience Planning. 10.1007/978-3-031-09183-4_8.

7. Chang, S., Brown, C., Handmer, J., Helgeson, J., Kajitani, Y., Keating, A., Noy, I., Watson, M., Derakhshan, S., Kim, J., Henriquez, A. (2022).-Business recovery from disasters: Lessons from natural hazards and the COVID-19 pandemic, International Journal of Disaster Risk Reduction, doi: https://doi.org/10.1016/j.ijdrr.2022.103191.

8. Dormady, N., Roa Henriquez, A., Rose, A.. (2017). Economic Resilience of the Firm: A Production Theory Approach. SSRN Electronic Journal. 10.2139/ssrn.3042815.

9. Dormady, N., Roa Henriquez, A., Rose, A., (2018). Economic Resilience of the Firm: A Production Theory Approach. International Journal of Production Economics. 208. 10.1016/j.ijpe.2018.07.017.

10. Rose, A., Wei, D.,Byrd, K., John, R. (2021). Economic Impacts of Spillover Effects of Terrorism Countermeasures at Public Assembly Sites. Journal of Homeland Security and Emergency Management. 19. 10.1515/jhsem-2020-0048.

11. Carpenter, S., Walker, B.,Anderies, J., Abel, N. (2001). From Metaphor to Measurement: Resilience of What To What?. Ecosystems. 4. 765-781. 10.1007/s10021-001-0045-9.

12. Burlutskiy, Sv. Burlutskii S., Margasova V. (2019). THE RELATIONSHIP BETWEEN SHORT-TERM FLUCTUATIONS AND STAGES OF ECONOMIC CYCLE: THE CASE OF UKRAINE. Revista ESPACIOS. DOI://www.revistaespacios.com/a19v40n10/19401010.html. Vol. 40. Nº 10.

13. Burlutsk,i Sv, Burlutski, S., Berezianko, T (2019). The export determinant of socio-economic resilience in foreign economic activity sustainable economic development. Journal of Life Economics. Istanbul. Vol.6. Issue 4, P.413-420.

14. Burlutski, S., Burlutski, Sv., Margasova, V. (2017). Resilience indicators for measuring sustainable economic development. Journal of Life Economics. Istanbul. Vol.4. Issue 2, P.35-48.

14. Methodology for measuring regional human development: approved by the decision of the Presidium of the National Academy of Sciences of Ukraine and the Board of the State Statistics Service of Ukraine from 13.06.2012 № 123-m. URL : https:// idss.org.ua/ukr_index/Metodika_ua.pdf., Annex 2.

15. Burlutska, S. (2015). Entropic characteristics of the mechanisms of the resilient reaction of the socio-economic system. Intellect XXI. №4. P.71-76.

16. Burlutska, S. (2016). Strategy of ensuring the resilience of the national economy sustainable development: theory and practice: monograph. Dnipro: Serednyak T. K. 320 p.

17. Monthly Business Outlook Survey. Official website of the National Bank of Ukraine. https://bank.gov.ua/en/statistic/nbusurvey.

18. Burlutski, S., Burlutski, Sv. (2015). The «resources curse» and special features of the economic growth in Ukraine. Journal of Life Economics. Istanbul. Vol.2. Issue 1. P.21-26.

19. Migration and Socio-Political Attitudes During Russia's Full-scale War Against Ukraine - Ninth Wave of the Survey*. September 2022.

20. Onyshchuk, I. (expert of the Decentralization Reform Support Office under the Ministry of Communities and Territories Development of Ukraine) Analysis of state and local budgets execution for 9 months of 2022. Swedish-Ukrainian Project "Support to Decentralisation in Ukraine", SALAR International https://decentralization.gov.ua/news/15748.

21. Burlutska, S. (2015). Identification of elasticity parameters of regions of Ukraine. Bulletin of the Volyn Institute of Economics and Management. №13. P.54-61.

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МЕТОДОЛОГІЧНІ ТА ТЕОРЕТИЧНІ ЗАСАДИ КОНЦЕПЦІЇ ПРУЖНОСТІ ПІДСИСТЕМИ ЗАБЕЗПЕЧЕННЯ НАЦІОНАЛЬНОЇ ЕКОНОМІКИ УКРАЇНИ В УМОВАХ ШОКОВИХ ЗБУРЕНЬ

Стаття присвячена методологічно-теоретичному обґрунтуванню та практичній перевірці доцільності застосування концепції пружності для оцінки впливу шокових збурень на підсистему забезпечення національної економіки України. У роботі зроблено припущення, що підсистема пропозиції національної економіки має властивості пружності та здатна поглинати шокові збурення за допомогою як статичних, так і адаптивних механізмів.

На теоретичному рівні дослідження запропоновано розрізняти динамічну та статичну складові пружності соціально-економічної системи. З'ясовано, що здатність соціально-економічної системи поглинати шоки після кризи може бути вродженою або адаптивною якістю. Запропоновано розуміти вроджену пружність як системну здатність протистояти кризам. Водночас комплекс додаткових зусиль або заходів формує адаптивну пружність і визначає здатність соціально-економічної системи підтримувати власне функціонування в кризових ситуаціях.

Показано, що за відсутності адекватної статистичної інформації про обсяги національного економічного виробництва емпіричний рівень дослідження може ґрунтуватися на квазііндексах очікувань економічної активності. Виходячи з цього припущення, в роботі запропоновано використання індексу очікувань ділової активності (ІОДА) Національного банку України для непрямої оцінки результатів економічної діяльності.

Визначено, що в умовах військової агресії Російської Федерації національна економіка України демонструє досить значну статичну пружність з ознаками відносного відновлення. Водночас на рівні підсистеми пропозиції формується тренд розгортання довгострокової фінансово-економічної кризи, що зумовлено як втратою природного та виробленого капіталу, так і вивільненням із сукупного виробництва значної кількості людського капіталу. Середньо- та короткострокові тенденції відновлення як ділової активності, так і статичних індикаторів пружності свідчать про адаптаційні зусилля з боку держави та значну зовнішню фінансову підтримку України у 2022 році.

Ключові слова: *пружність, підсистема пропозиції, шокові збурення, динамічна економічна стійкість, індекс очікувань ділової активності, згладжена ковзна середня.*