DOI: *https://doi.org/10.53486/ser2025.20*
International Scientific and Practical Conference, 4th Edition, March 27-28, 2025, Chișinău, Moldova

STRUCTURAL AND TECHNOLOGICAL POLICY AS A TOOL TO ENSURE ECONOMIC RESILIENCE

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Abstract: *The article is devoted to the problems of ensuring economic resilience through the implementation of structural and technological policy measures in the conditions of growing economic uncertainty and sudden shocks. The article considers the essence of economic resilience, identifies the main components that ensure this process: absorptive capacity, adaptive capacity and transformative capacity of the system. It is emphasized that in the conditions of growing economic uncertainty and intensification of catastrophe shocks it is possible to achieve resilience on the basis of structural and technological policy measures. Two main channels of structural policy that contribute to the achievement of dynamic balance and resilience of the economic system are identified: these are measures aimed at (I) increasing the flexibility of the economic system, and (II) strengthening the capacity of the economy and ensuring the stability (robustness) of its structure. It is noted that in the context of geopolitical risks and increasing regionalization of the world economy, the approaches and principles of structural policy are being transformed (the course on securitization, ensuring technological and financial sovereignty, strengthening the role of the state in the economy). At the same time, the change in the content of structural policy and strengthening of its protectionist nature allows successfully absorbing sudden shocks, but creates obstacles for accelerated economic growth in the long term.*

Keywords: *Economic resilience, uncertainty, risks, shocks, transformational resilience, structural and technological policies.*

UDC: *330.342+338.2:330.35*

Classification JEL: *F52, L16.*

1. Introduction

Currently, there is a steady slowdown in economic growth worldwide. This process is largely due to the consequences of the global financial and economic crisis, the coronavirus pandemic, as well as the difficulties in adapting economies to rapidly changing development conditions. Increasing economic uncertainty and complexity of ongoing economic processes, growing waves of systemic shocks and catastrophes, which are intensified by the action of geopolitical factors and the restructuring of the world economy, cause a decline in the potential of economic development in the long term.

The speed of adaptation of the economic system to new conditions of functioning, stress factors and large-scale shocks with a cascading effect depends on the resilience of the economy, its ability to withstand risks and quickly recover from crises. Structural and technological policy is one of the key instruments ensuring the resilience, i.e. flexibility and sustainability of the economic system. It promotes technological renewal of the economy and increases the reallocation of resources between sectors, as well as stimulates the structural complexity of the economy, which in turn contributes to the increase in total factor productivity and long-term economic growth. The purpose of the article is to reveal the essence of economic resilience and to consider the mechanisms through which structural-technological policy ensures the economy's resilience to sudden shocks, to

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formulate conceptual directions for improving structural-technological policy to increase the long-term growth potential.

2. Literature Review

Economic resilience is a relatively new subject of scientific research, which came to economics from physics, mathematics and engineering sciences, where it denotes the ability of a system to return to a state of equilibrium after a displacement [1]. In economics, the concept of resilience is closely related to the system approach and the economic theory of complexity, and began to be actively developed only in the mid-2000s. A review of the literature allows us to identify three main waves of increasing interest in the problem under study. The first wave is observed in the period after the global financial and economic crisis; the second one - in the period after the coronavirus pandemic; and then a new surge in 2022 - 2024, associated with the intensification of systemic shocks caused by geopolitical risks and economic turmoil (Figure 1).

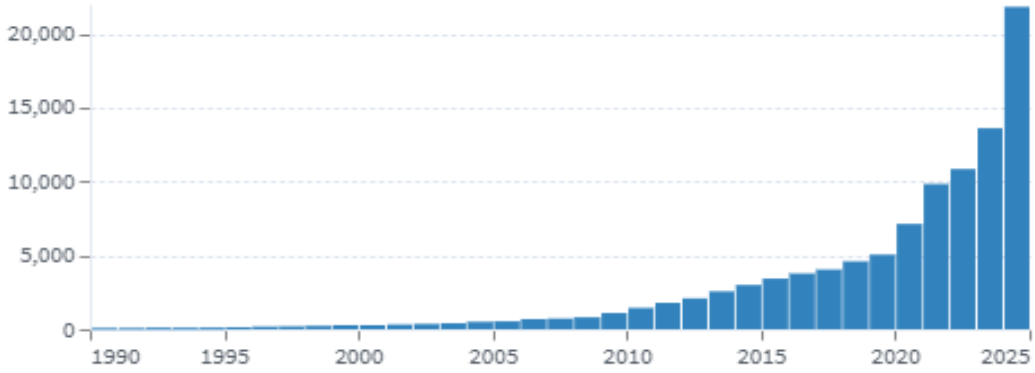

Figure 1. Number of scientific publications on the topic of economic resilience
Source: www.lens.org

Analyses of the subject area on business and economics show an exponential surge of interest in the problem of economic resilience in 2022 - 2024, which correlates closely with the exacerbation of systemic risks, sudden shocks and the challenges of global economic uncertainty during this period (Figure 2).

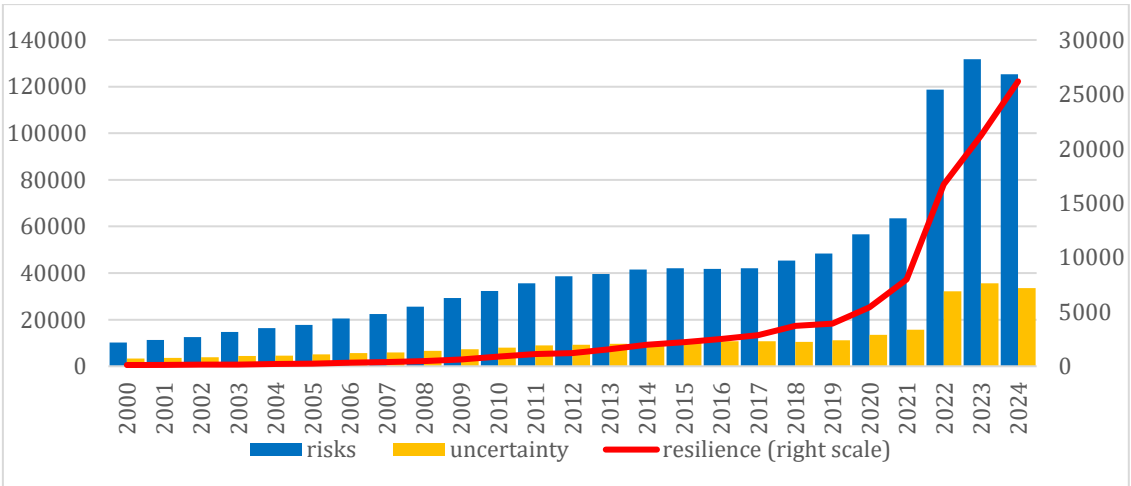

Figure 2. Number of scientific publications on economic resilience, risks and uncertainty
Source: www.lens.org

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The concept of resilience is close to the concept of sustainability. However, sustainability implies the ability of the economy to pre-empt risks, reduce the probability and depth of the fall in economic dynamics, quickly recover from shocks and return to the pre-crisis development trajectory. At the same time, resilience reflects the permanent ability of the economy to absorb risks, its ability to function normally in the conditions of a continuous increase in shocks and threats.

Thus, according to the definition [2] economic resilience is the ability of a system exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.

The ability of the economy to develop normally in an environment of growing uncertainty and risks, to preserve its key properties and characteristics, to resist numerous external and internal challenges is ensured through change management [3]. In contrast to sustainability, the concept of resilience is considered here as a management process rather than a result, which implies the implementation of policy measures on a continuous basis to anticipate shocks, to counteract challenges and threats to the economy and to adapt to changing development conditions.

According to [4] the resilience of the economic system is ensured by three main components, which are related to each other:

- absorptive capacity, which is the ability of the economy to absorb shocks on a permanent basis, to pre-empt, mitigate and prevent the onset of potential risks and shocks, ensuring the stability of the system;
- adaptive capacity, which implies the ability of the economy to adjust and change its basic characteristics to mitigate likely damage without compromising the structural identity and functional properties of the system. This property implies the possibility of incremental changes in the economic system to increase its flexibility;
- transformative ability, which implies the possibility of creating a fundamentally new economic system under conditions of increasing disturbances, which is least exposed to risks and threats, and creates opportunities for changing the vector of transformation of the system to a qualitatively new level [5].

The role of the components of resilience at different stages of perturbations of the economic system differs significantly: as the intensity and duration of perturbations increase, there is a transition from the absorptive capacity of the economy to adaptive, and then to transformative, which is considered as a key element of the economy's adaptation to disruptions and perturbations that have a sustainable long-term nature (Figure 3).

It seems that it is transformative resilience, which is the main driver of structural adjustment of the economy to long-term challenges and is considered as «bouncing forward to capture the mechanisms and processes that underpin positive adaptation and structural change in response to an acute crisis» [5].

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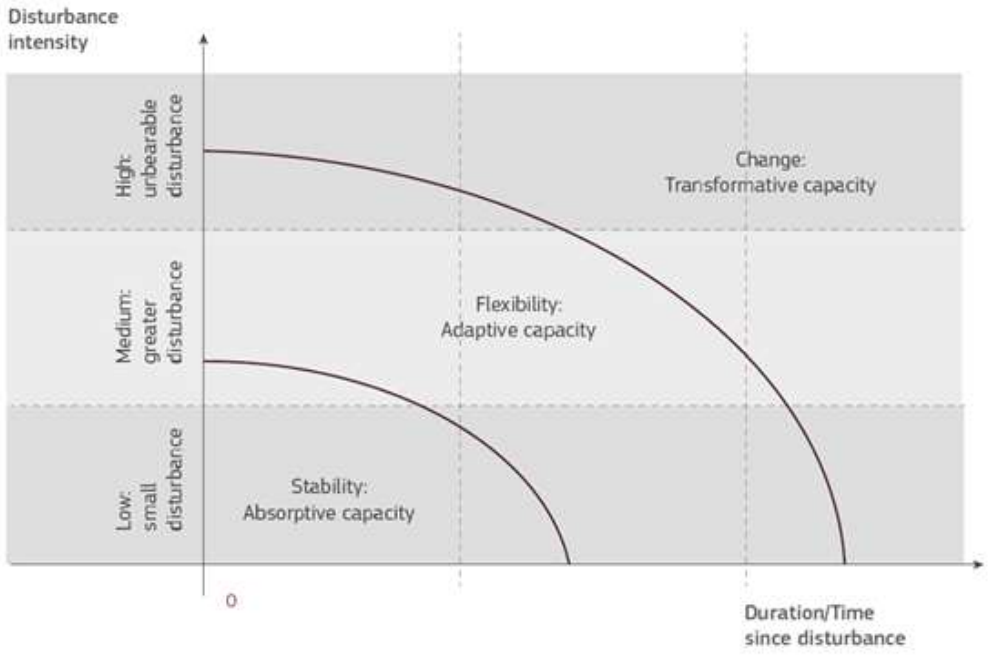

Figure 3. Change in the role of economic resilience components at different degrees of intensity and duration of disturbances

Source: [6]

In this regard, the study of factors and mechanisms of structural and technological policy that contribute to the transformational resilience of the economy is of particular relevance.

3. Methodology

The methodology of this study is based on a qualitative analysis of economic literature that investigates the problems of ensuring the resilience of the economic system through structural and technological policy measures. The methods of system analysis, synthesis, deduction and induction, comparative economic analysis were used in this study.

The first stage of the study involves collecting and analyzing data from official sources describing the dynamics of economic uncertainty and disruption shocks in the world. Then, the literature describing the mechanism of ensuring economic resilience and the economy's resistance to shocks of ripple effects through the formation of redundancy of reserves and the ability of the economy to change its structural and functional characteristics through rapid reconfiguration of resources is reviewed. Based on these conceptual approaches, the key channels of structural and technological policy that influence the rigidity and flexibility of the economic system and support the dynamic resilience of the economy are identified.

The discussion section analyses the changes that structural-technological policy undergoes in the context of increasing economic uncertainty and regionalization processes of the world economy, and considers its possible risks associated with the loss of flexibility in the context of increasing protectionist nature of structural policy. In the final part of the article, based on the results of the study, recommendations in the field of structural policy measures aimed at maintaining the resilience and flexibility of the economic system are developed.

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4. Main Results

Currently, there is a radical increase in economic uncertainty around the world. The analysis shows that the Monthly Global Economic Policy Uncertainty Index reached its multi-year high by the beginning of 2025, exceeding the level of pandemic 2020 (Figure 4).

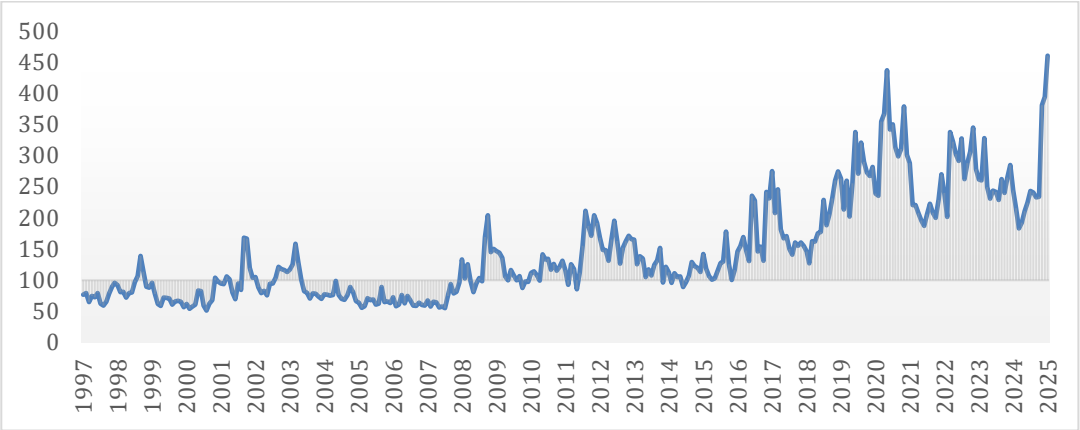

Figure 4. Monthly Global Economic Policy Uncertainty Index (100 = mean value)
Source: https://www.policyuncertainty.com/index.html

Increasing global uncertainty is associated with the rapid growth of systemic risks and «disaster shocks» in the world, which are mainly caused by two groups of reasons. On the one hand, it is the human impact on the environment, provoking environmental problems, negative natural, climatic and technological changes. On the other hand, it is the increasing complexity of socio-economic processes taking place in the world, the intensification of the struggle for technological superiority, which cause the reformatting of the system of international economic relations and the restructuring of the global economy, triggering hard-to-predict long-term consequences [7].

The consequence of the ongoing changes is a multiple increase in the number of man-made disasters, natural disasters, pandemics (Table 1), which lead to increased economic divergence between countries, aggravation of the struggle for resources, interstate confrontation.

Table 1. Dynamics of significant disasters and catastrophes in the world, units

Years	Geophysical	Climatological	Hydrological	Meteorological	Epidemic	Technological	Total
1961-1965	31	26	77	93	11	42	280
1966-1970	72	47	130	130	28	63	470
1971-1975	36	29	116	134	6	114	435
1976-1980	110	79	205	191	49	186	820
1981-1985	110	97	292	284	43	267	1093
1986-1990	133	83	358	415	91	845	1925
1991-1995	166	87	469	452	109	924	2207
1996-2000	152	185	664	519	372	1303	3195
2001-2005	198	161	900	685	311	1748	4003
2006-2010	151	122	1046	575	204	1303	3401
2011-2015	159	128	813	609	108	1032	2849
2016-2020	140	126	905	606	122	788	2687
2021-2025 (March)	136	149	815	639	54	661	2454

Source: The International Disaster Database https://www.emdat.be

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The danger of «disaster shocks» lies in their cascading (ripple) spread, which, having started in one sphere, spreads to other sectors and regions through the domino effect, causing systemic shocks in the economy, up to destructive ones. In the conditions of rapid growth of radical uncertainty and destructive impacts, the ability of transformational resilience of the economy, which is possible on the basis of continuous improvement and restructuring of the basic structures of the economy, regrouping of its elements, properties and resources, becomes especially important [8]. In general, the mechanism of ensuring the resilience of the economy is described by the model developed by Norris [1] (Figure 5).

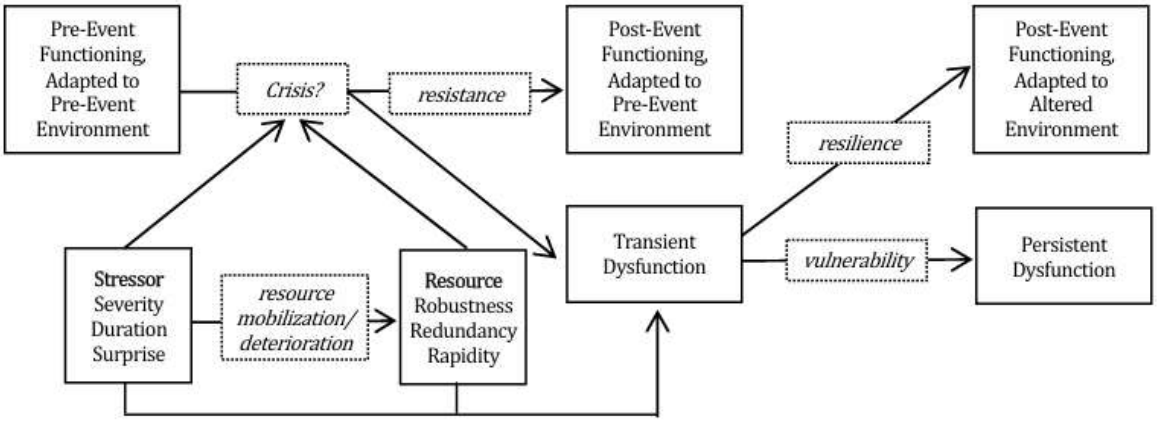

Figure 5. Model of stress resilience and resilience over time

Source: [1]

As follows from the model, the main condition that is necessary to ensure the resilience of the economy is sufficiency (redundancy), reliability and speed of movement of resources, which allows to regroup them to maintain stability and prevent dysfunction of the system. From these positions it is the structural policy that creates opportunities to create new reconfigurations of the structures and functions of the economy in response to shocks [9], and also allows to form a safety margin of the economy, to form reserves to compensate for the probable damage in case of shocks and disasters [10].

Structural and technological policy is an interconnected set of measures aimed at overcoming the limitations of economic growth, smoothing imbalances, developing the production and export potential of the economy, increasing the innovation and technological leadership of the country based on the mechanisms of investment support and financial incentives for strategic goals and priorities of economic development of the state.

In the most general form, structural policy can influence the resilience of the economy by achieving a dynamic balance between two properties of complex systems – robustness and flexibility of the economic structure. Robustness is related to the redundancy of resources and rigidity (resistant) of the system and implies the preservation of its structural stability in the face of shocks, while flexibility is the adaptive ability of the economy to change, which is maintained by changing processes and structure in response to internal and external disturbances [8, 11].

In this context, the impact of structural policy on ensuring the resilience of the economy is realised through two main channels. The first channel is related to ensuring the flexibility of the economy by supporting market instruments, self-development and self-regulation mechanisms, which contribute to the effective reallocation of resources in the economy. As a rule, this implies the development of the private sector and the institution of

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entrepreneurship (organizational complexity of the system), liberalization of the labour and capital markets, disposal of inefficiently operating enterprises and their replacement by new, fast-growing and highly productive companies. Basically, these are reactive economic policy measures aimed at maintaining the system's transformative resilience in a changing economic environment (Figure 6).

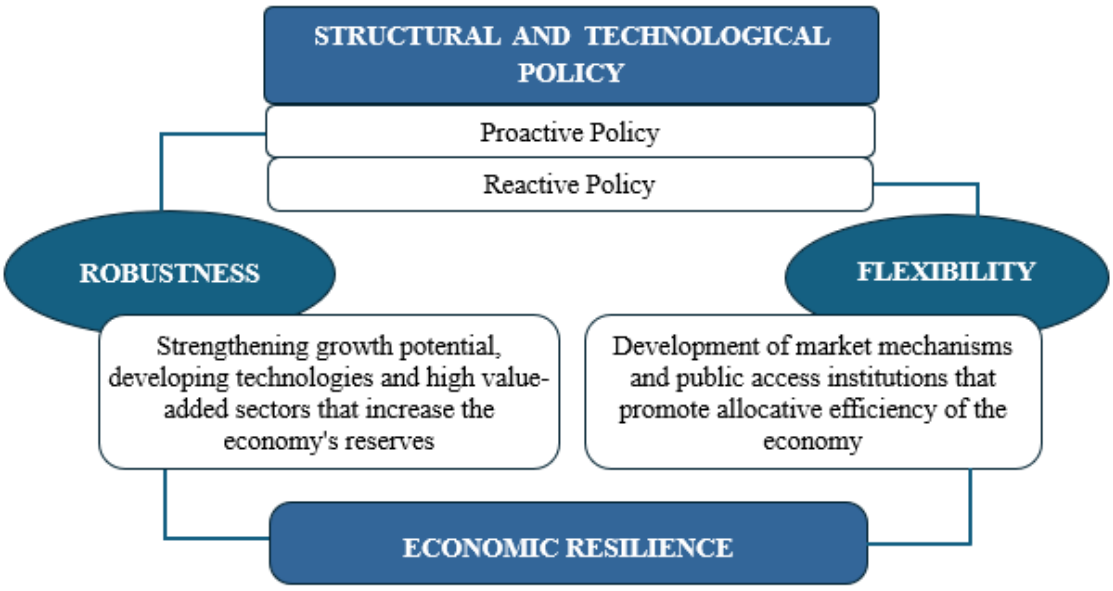

Figure 6. Impact of structural and technological policy on economic resilience

Source: developed by the author based on [11]

The second channel implies the implementation of proactive industrial and technological policy aimed at strengthening the potential of the economy and maintaining the stability (robustness) of its structure. The action of this channel implies advanced development of sectors of the economy with high potential and having developed competitive advantages. Usually, these goals are achieved through increased financing and investment in promising sectors of the economy approaching the global technological frontier. In addition, this direction includes measures to diversify the economy, expand the product space and potential opportunities for the development of new technologically complex industries, taking into account the accumulated competences and available resources. This makes it possible, in case of systemic shocks and deterioration of the economic situation, to switch output between industries, ensuring the maintenance of sustainable production dynamics.

5. Discussion

Meanwhile, at present there is a significant transformation of approaches and principles of structural and technological policy implementation, which is caused by the growing radical uncertainty and strengthening of disruptive shocks. This transformation is associated with the need to protect national interests and maintain the economic security of the state in the conditions of reformatting the system of international economic relations and increasing fragmentation of the world economy. In these circumstances, most countries are implementing a structural and technological policy, which has the following specifics.

Firstly, it is the strengthening of securitization of structural policy, i.e. strengthening of its trend to protect strategic national interests and ensure security,

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primarily in the production and technological sphere, which is implemented through the policy of reshoring and nearshoring.

Secondly, as a result, there is a significant strengthening of the role of the state as the main regulator and key investor in the economy, and the expansion of the state sector in the economy.

Thirdly, it is a change in the model of structural policy implementation - a shift from horizontal, non-selective support of the economy to an increase in targeted state financing of strategically important sectors. Thus, the volume of support for the economies of developed countries in the conditions of the 2020 pandemic was about 15%, for developing countries 5% of GDP. At the same time, the size of the budgetary impulse in the Russian economy for 2022 – 2023 is estimated at 8% of GDP, in 2024 just over 3% of GDP. At the same time, the states are providing unprecedented financial support to national producers and directing colossal volumes of investment into sectors of strategic importance. For example, China's dual-circulation strategy, adopted in 2020, provided about US$250bn in budgetary support; at the end of 2024, it will be just over 3% of GDP. For example, in China, under the dual circulation strategy adopted in 2020, the volume of budget support amounted to about $250 billion; at the end of 2024, the adoption of a package of economic stimulus measures in the amount of $1.4 trillion was announced. In the United States, in accordance with the Chip and Inflation Reduction Act adopted in 2022, economic support measures in the amount of over $420 billion are envisaged until 2030.

Fourth, the core of the structural policy implementation in the context of global security challenges is the course to achieve technological and financial sovereignty, which implies the reduction of dependence on other countries in the field of critical technologies and the ability to conduct an independent and self-sufficient financial and credit policy, resistant to external shocks, risks and threats. Meanwhile, this feature creates risks of slowing down global technological development and fragmentation of the global monetary and financial system, increasing transaction costs of the economy and hindering long-term economic growth.

Such an architecture of structural and technological policy has its own advantages associated with strengthening the ability of the economy to absorb shocks through the formation of reserves and stocks in strategically important sectors of the economy. At the same time, this approach generates the risk of weakening and disrupting the functioning of the flexibility channel (structure variability), which ensures the resilience of the economy. Studies show that the most resilient economies are technologically complex and liberalized economies with developed market institutions that have both high rigidity and flexibility of the structure (the USA, the EU, Japan, etc.). At the same time, robust systems, economies with high rigidity and insufficient flexibility of the structure, usually successfully absorb shocks, but poorly restore productivity growth and, as a rule, experience a decline in resilience with a simultaneous increase in the risk of destabilisation in case of shocks [12].

5. Conclusions

The above raises concerns that the implementation of structural and technological policies with a strong protectionist character will hamper long-term economic growth rates, stimulating inequality and economic divergence between countries. The solution to this problem implies the need to develop policies that maintain the necessary flexibility in the economic system. In this regard, measures to support the private sector and small and medium-sized enterprises, which are highly flexible and adaptive in overcoming the

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obstacles associated with the fragmentation of the global economy, seem necessary. It is necessary to create conditions to facilitate the reallocation of resources in the economy, which are associated with the liberalization of the labour market and increased flexibility in the movement of labor resources in the economy. It is necessary to create conditions favorable for the development of the financial sector, which, by attracting funds from private investors, will make it possible to finance large-scale structural and technological transformations in the economy.

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