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Financial Indicators of the Oil and Gas Industry in the Region to Assess Its Economic Security under Sanctions

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ABSTRACT

The subject of this study is the system of financial and economic relations in oil and gas regions that ensures an increase in their level of economic security. This is measured by several criteria, including the net financial result, turnover, and the proportion of unprofitable industrial organizations in the region. Additionally, it is measured by the ratio of fixed capital investment, accounts payable, and receivables to the GRP. The aim of the research is to develop methodological approaches for assessing the economic security level of a region, and to provide systemic support for the growth of financial results in the oil and gas industry of that region. Additionally, the research aims to enhance the resilience of the region's economy in the face of potential external threats to its logistical, scientific, technological, and fuel and energy independence, which are crucial components of national economic stability. The following main tasks have been identified and completed: theoretical studies on the issues of state and corporate financial support for regional investment projects, with a focus on Russian industrial policy's transition to technological sovereignty and new industrial development formats in a changing global financial landscape; theoretical research into the formation of institutional mechanisms for utilizing hard-to-recover hydrocarbon resources to revitalize and reindustrialize regions with a petrochemical industry that forms the basis of their budgets, ensuring the preservation and growth of well-paying jobs and profitable activities in related and service sectors.; Regression, structural and variance analysis of the net financial result, turnover, and share of unprofitable regional industrial organizations, as well as the formation and evaluation of criteria for regional economic security based on the ratio of investments in fixed assets, accounts payable, and receivables to the gross regional product. The results are presented in the form of a unique research algorithm identifying the close relationship between the financial indicators of economic security in the oil and gas regions of the Volga Federal District and their interregional hierarchical clustering. This was revealed during the original research process, as a new approach to using financial indicators in industry to mobilize economic resources horizontally and use regulatory tools to overcome imbalances between regions in the national economy, which can lead to crisis situations and a decrease in overall economic security.

Keywords: regional finance; economic security; regional economy; industrial economics; oil and gas region; natural resource economics

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INTRODUCTION

Improving the financial performance of organizations in the oil and gas sector can be crucial in enhancing their economic security in light of financial, economic, scientific, technological, logistic, innovative, industrial, and fuel and energy independence, as well as the high volatility of oil and gas resource prices. Taxes on profits, property, and personal income are the main sources of revenue for regional budgets. In Russia's oil and gas-rich regions, highly profitable activities such as extracting and processing oil and gas often lead to strong financial results for related industries and services. However, these activities also require flexible management in light of a deteriorating resource base. This requires additional costs for production and processing, which can be challenging.

The sanctions imposed on Russia's oil, gas, and financial sectors have significantly increased the importance of developing economic security for oil and gas regions. These regions are vital for the stability and resilience of Russia's economy [1]. Systematic support for the growth of financial results of organizations in the oil and gas region involves the development of:

- innovative high-tech oil and gas production and oil and gas processing machinery and high-tech technologies for creating new materials with a controlled set of properties based on deep chemical processing of oil and gas of various fractional composition;
- a resilient logistics infrastructure that can withstand sanctions that solves the problems of insurance and freight of Russian oil cargo and multifunctional strategic storage facilities for oil and gas raw materials and petroleum products.

The industrial and post-industrial economies, which are significantly dependent on oil and gas, are subject to both well-established challenges, such

as financial and speculative energy management tools (derivatives), the agreements of the OPEC and OPEC+ alliance, trends in decarbonization and the "green" climate doctrine, as well as relatively new challenges in the form of sanctions restrictions and the likelihood of large amounts of finance moving in digital format. The changing contours of the global economy, along with investments in cryptocurrencies, can be seen as indicators of the transition to a new technological order based on new circumstances of the existence and functioning of monetary relations.

THE DEGREE OF STUDY AND ELABORATION OF THE PROBLEM

The financial performance of industrial organizations in the oil and gas sector is closely linked to the corporate social responsibility policy of vertically integrated oil and gas companies, which includes the development of a high-tech and innovative production infrastructure. This also includes contractors and service organizations in the oil, gas, and related industries. These companies ensure social and environmental responsibility while taking into account the challenges of emerging capital markets [2, 3]. This requires a state-led, nationally oriented strategy for providing tax incentives for the scientific, technological, and innovative industrial sectors, with the goal of promoting regional economic security. This strategy should be based on the formation of highly profitable territorial petrochemical clusters, which will create open, diffuse agglomerations, and increase the competitive advantages of the national industrial core [4–6].

In light of the current sanctions and the high volatility of oil and gas prices in global markets, as well as the development of trends towards import substitution, energy independence, and technological innovation, the effectiveness

of government support measures for the rational location of Russian industries is enhanced by the benefits of corporate governance, including innovative activity, financing through share and bond issues, and diversification of production [7, 8]. Oil and gas corporations play a significant role in Russian economic dynamics due to institutional changes in the process of investing in fixed assets and their reproduction, as well as in regional investment projects under concession agreements that provide financial support for regional economic stability [9–12].

The backbone sectors of the Russian economy, including the oil and gas industry, especially under the conditions of sanctions pressure, require a complex of scientific, technological and logistical sovereignty. This may be possible when achieving the principles of economic development of “Noonomics”, solving the problems of a closed production cycle and digital transformation of industry in industrially developed oil and gas regions [13–15]. A nationally oriented economic policy also ensures high financial and energy sustainability in a rapidly changing global financial and economic landscape, fuel and energy sectors. This is achieved through a high level of budget balance, based on the benefits of expanding the institutional framework for the development of hard-to-reach hydrocarbon resources in the oil and gas regions with “old” production, and their neo-industrialization as a result of cross-sectoral economic interaction [16–19].

The existential challenges facing the Russian economy could be addressed through strategic planning for the revival of the old industrial oil and gas sector, based on mechanisms to foster innovation in the oil and gas industry and related sectors such as high-tech petroleum mining and processing equipment. This would lead to import substitution of high-quality services, creating an acceptable

level of regional economic security and resilience [20–22]. Institutional and infrastructural transformations in the financial system of the oil and gas sector are essential in determining approaches to the development of hard-to-reach raw materials for oil production and increasing regional economic stability. This is based on the systematic support for the financial performance of industrial companies in a nationally-oriented economy, with financial and economic regulations to meet the needs for expanded reproduction in the oil and gas industry [23–25].

As a result of the functioning and interaction of individual levels of the financial system in the oil and gas region, interconnections and interdependencies may appear, forming advantages of a cluster-type of territorial development and spatial heterogeneity in regional economic dynamics, with a possible increase in the resilience of the economy to the volatility of oil and gas resources globally and problems of uncertainty with sanctions on the export of raw materials and processed products. This can help achieve the goals of decarbonization and the circular economy [26–29]. Structural transformations of the mechanisms of interaction between government and corporate financial instruments, considering the peculiarities of capital circulation and financial flows in oil and gas regions, can help counteract the asymmetric effects of inter-budgetary and regional monetary relations and increase the economic efficiency of petrochemical production clusters [30, 31]. The high financial results of “anchor” enterprises in the oil and gas industry, as part of intersectoral production clusters, are able to cover the variable costs of necessary institutional transformations in the regional economic system, with the aim of increasing the level of economic security and resistance to external shocks. This is done by taking into account changes in

the spatial structure of macroeconomic indicators [32–34].

The distribution and mitigation of threats to the economic security of the oil and gas region in various sectors of the economy, primarily production, finance, and foreign trade, can support its economic growth based on a targeted stimulating tax strategy and fiscal decentralization. This creates favorable conditions for the development of manufacturing industry and reduces the heterogeneity of national economic space [35–37]. Fixed and working capital, as part of the corporate economic security resources, and the scientific and technical potential of organizations in the oil and gas region, contribute to attracting uncontrolled foreign investments into the Russian stock market. This may affect the transformation of regional budgets by introducing investment tax incentives and expanding financial instruments to adapt to new types of risk [38–41].

METHODOLOGICAL APPROACHES

The study is based on the example of the oil and gas regions in the Volga Federal District, which ranks second in the country in terms of production and first in terms of processing of oil and gas raw materials. These regions include entities with a budget-forming oil and gas industry: the Republic of Tatarstan (RT), the Republic of Bashkortostan (RB), Samara Region (SR), Perm Territory (PT), Orenburg Region (OR) and the Udmurt Republic (UR). They are characterized by common problems such as reducing the quality and recoverability of oil production, foreign trade turnover, and the rational use of associated petroleum gas. Additionally, there is an increased social and environmental responsibility for the extraction and processing of oil and gas resources in these areas.

At the same time, within the sample of regions under review, there is a significant variation in the financial performance of

organizations. This includes differences in the balance of accounts payable and receivable, as well as the distribution of profitable and unprofitable businesses by type of economic activity, organizational and legal form, and ownership.

The study uses regression analysis of the dynamics of net financial results and the share of unprofitable organizations in oil and gas regions, constructing a system of equations to describe them. It also includes structural analysis of fixed asset investments, the volume of goods shipped from mining and manufacturing industries, and accounts payable and receivable to GRP. As a result of the variance analysis of the data obtained, a close relationship was revealed between the calculated financial indicators of economic security in oil and gas regions. This led to the need for cluster analysis of these regions, which identified similar entities with financial and industrial potential for increasing their economic security. The presented interregional hierarchical clustering of oil and gas regions based on levels of economic security is an original methodological approach to developing protective mechanisms for thresholds and increasing the safety margin for national economic security in the face of sanctions.

RESULTS AND DISCUSSION

The share of unprofitable organizations in the Volga Federal District began to decline sharply after a slight rise until 2020. This may be explained by the adaptation of the Russian economy to the first wave of Western sanctions in 2014, as well as the likely decrease in their effectiveness due to the pandemic crisis, which has particularly noticeably affected the global fuel and energy balance. This factor may explain the slower decline in the share of unprofitables in oil and gas regions relative to the average for the district. At the same time, it should be noted that the dynamics of the net financial results

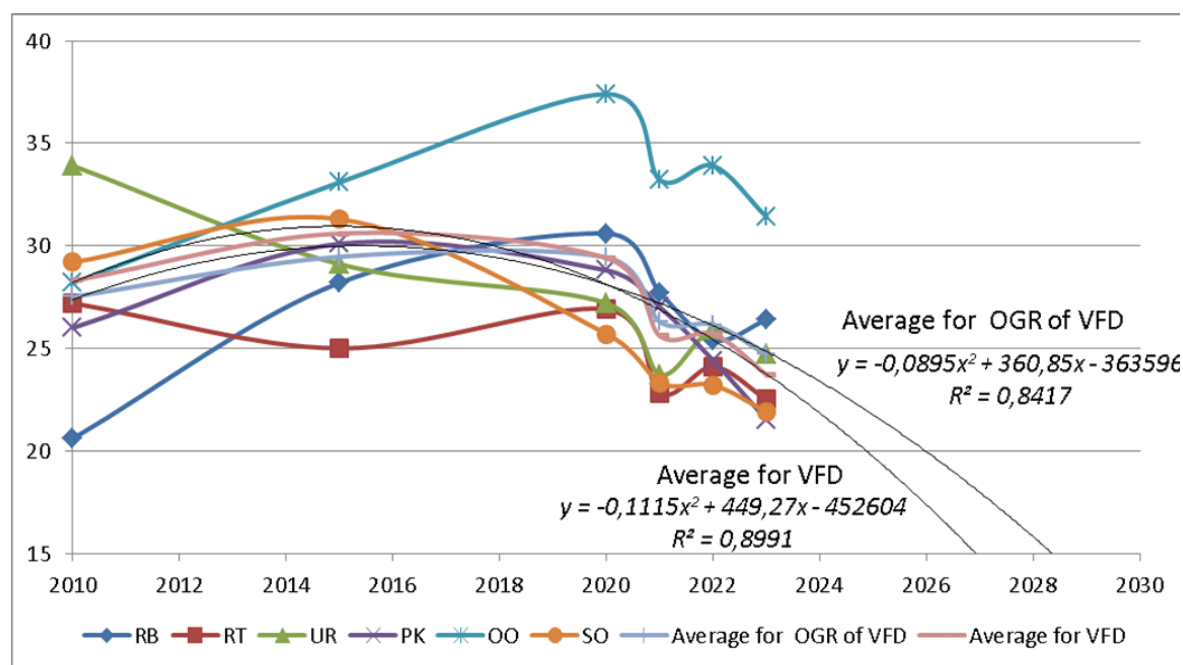


Fig. 1. Dynamics and Forecast of the Share of Unprofitable Organizations in the Oil and Gas Regions of the Volga Federal District, as % of All Organizations

Source: Compiled by the author according to Rosstat. Regions of Russia. Socio-economic Indicators. 2024. Statistical Collection. Rosstat. Moscow; 2024. 1081 p.

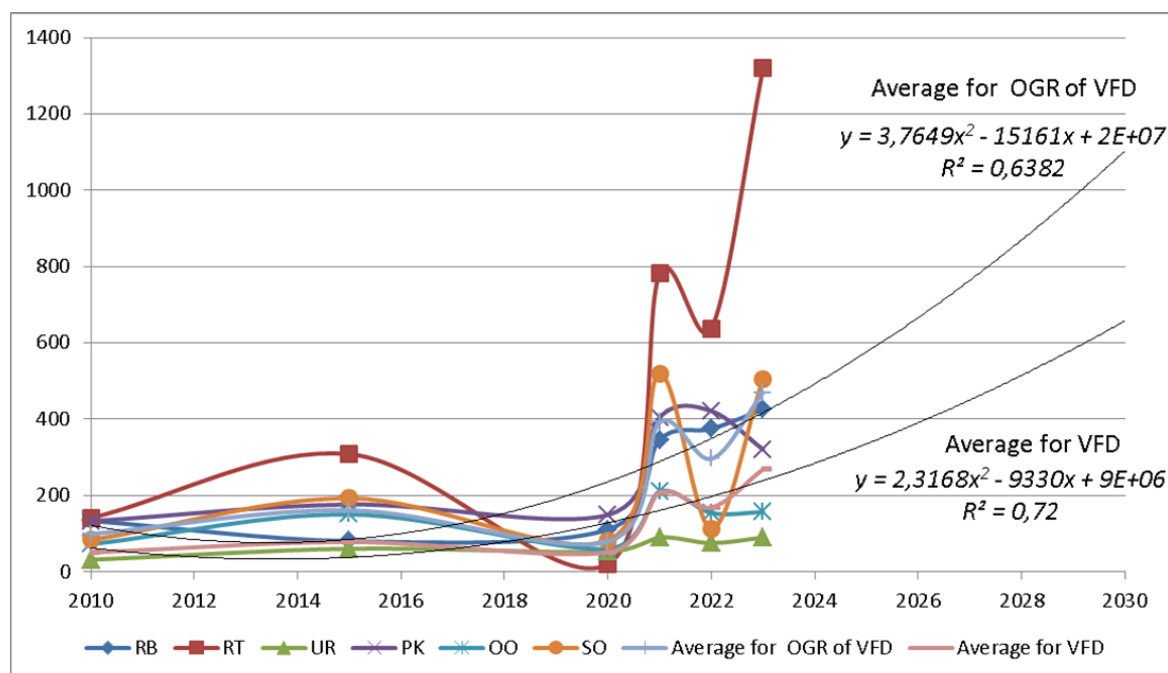


Fig. 2. Dynamics and Forecast of the Balanced Financial Result of Organizations in the Oil and Gas Regions of the Volga Federal District, in Billion Rubles

Source: Compiled by the author according to Rosstat. Regions of Russia. Socio-economic Indicators. 2024. Statistical Collection. Rosstat. Moscow; 2024. 1081 p.

of organizations in the oil and gas sector has shown a sharp increase since 2020, with a significant excess relative to the average indicator for the region. Based on this, we can assume that the oil and gas industry, which is the main contributor to the budget, has the potential to influence the mechanisms for increasing the “safety margin” for regional economic security, even with a slowdown in the decline in the number of unprofitable companies due to sanctions. The growth of financial results from industrial enterprises contributes to increased stability in the region (*Fig. 1 and 2*).

The transformation of paired regression equations from polynomial form to exponential form, which is most appropriate for them, leads to the following system of equations for a dynamics model and forecasting of the balanced financial results of regional organizations.

$$Y \text{ average for OGR of VFD} = 7E - 84e^{0.0975x}$$

$$Y \text{ average for VFD} = 8E - 95e^{0.1097x},$$

where Y — net financial result of organizations, x — reporting period.

The oil and financial embargoes have a particularly negative impact on the logistics, innovation, and industrial potential of regions where oil and gas companies contribute a significant share of income tax revenue to the regional budget and generate highly profitable production activities for related industries and sectors of the economy. This threatens the indicators of regional economic security, both in the public sector and in the business sector. In the public sector, it affects the volume and structure of the budget deficit (or surplus), foreign trade turnover, and the debt burden of the regional budget. In the business sector, it impacts investments in fixed assets, accounts payable, and financial results (as a percentage of the gross regional

product). The most significant proportion of unprofitable mining organizations is observed in Orenburg region. This region is most focused on this type of economic activity, which determines the high unprofitability of other organizations in this field. According to the structure of net financial results of organizations in oil and gas regions, the highest values are observed in manufacturing industries in the Republic of Bashkortostan, Perm Territory, and the Udmurt Republic. This, along with a low proportion of unprofitable organizations in these regions across all types of economic activity, places their economic security above that of the most productive Republic of Tatarstan. (*Fig.3,4*).

The lowest turnover of organizations engaged in oil and gas activities in the mining industry is observed in the Republic of Bashkortostan and Samara Region. These regions have approximately equal volumes of oil production and refining, and Rosneft, Russia's largest vertically integrated oil and gas company, which may explain the similarity in turnover levels between these entities in the manufacturing sector.

The turnover structure of industrial organizations in the oil and gas regions of the Volga Federal District corresponds fairly well with the structure of the ratio between the volume of goods shipped from mining and manufacturing activities and GRP. At the same time, the ratio of investments in fixed assets to GRP is significantly lower than the ratios of accounts payable and receivables to GRP, which may indicate an imbalance in the thresholds of financial indicators for regional economic security (*Fig. 5, 6*).

The results of the variance analysis of the data presented in Figure 6 showed the absence of an interregional relationship between the main financial indicators of economic security, but a close relationship was found between the sets of these indicators themselves for oil and gas regions, which led to the need to

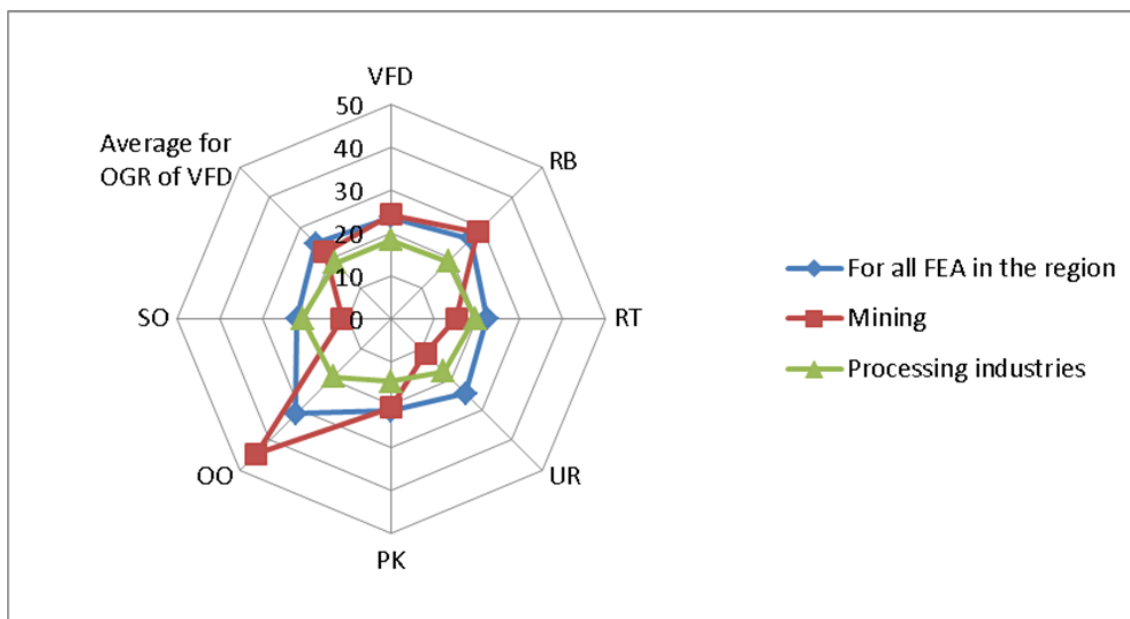


Fig. 3. The Structure of the Share of Unprofitable Organizations in the Oil and Gas Regions of the Volga Federal District by Main Types of Economic Activity in 2023, % of the Total for this Foreign Economic Activity

Source: Compiled by the author according to Rosstat. Regions of Russia. Socio-economic Indicators. 2024. Statistical Collection. Rosstat. Moscow; 2024. 1081 p.

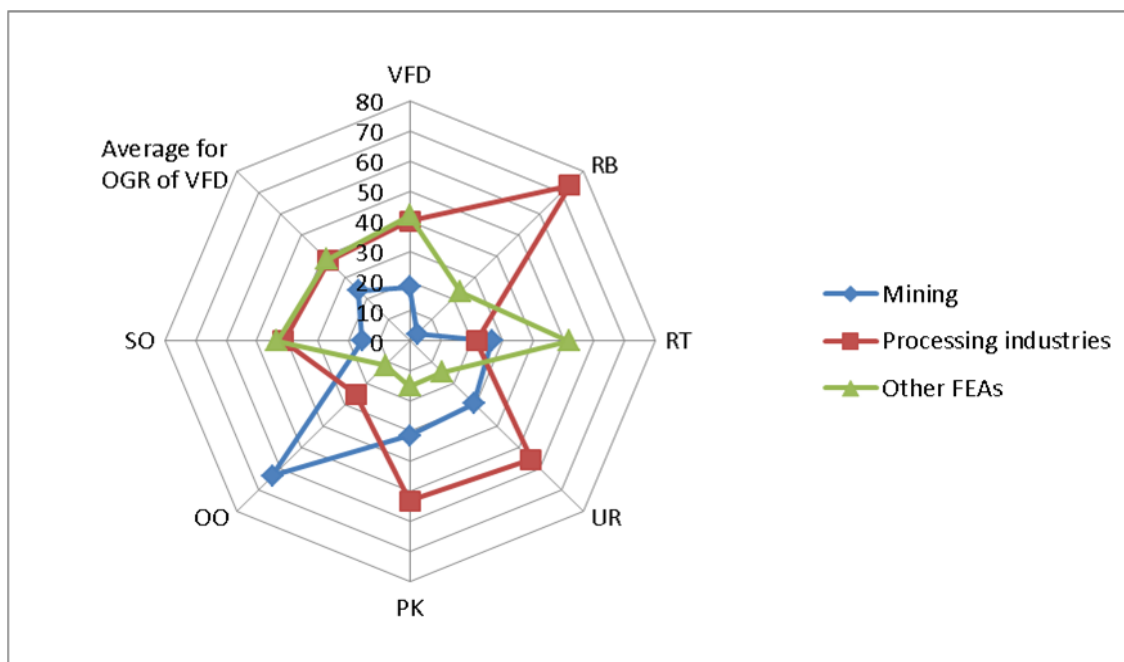


Fig. 4. The Structure of the Balanced Financial Result of Organizations in the Oil and Gas Regions of the Volga Federal District by Main Types of Economic Activity in 2023, % of the Total

Source: Compiled by the author according to Rosstat. Regions of Russia. Socio-economic Indicators. 2024. Statistical Collection. Rosstat. Moscow; 2024. 1081 p.

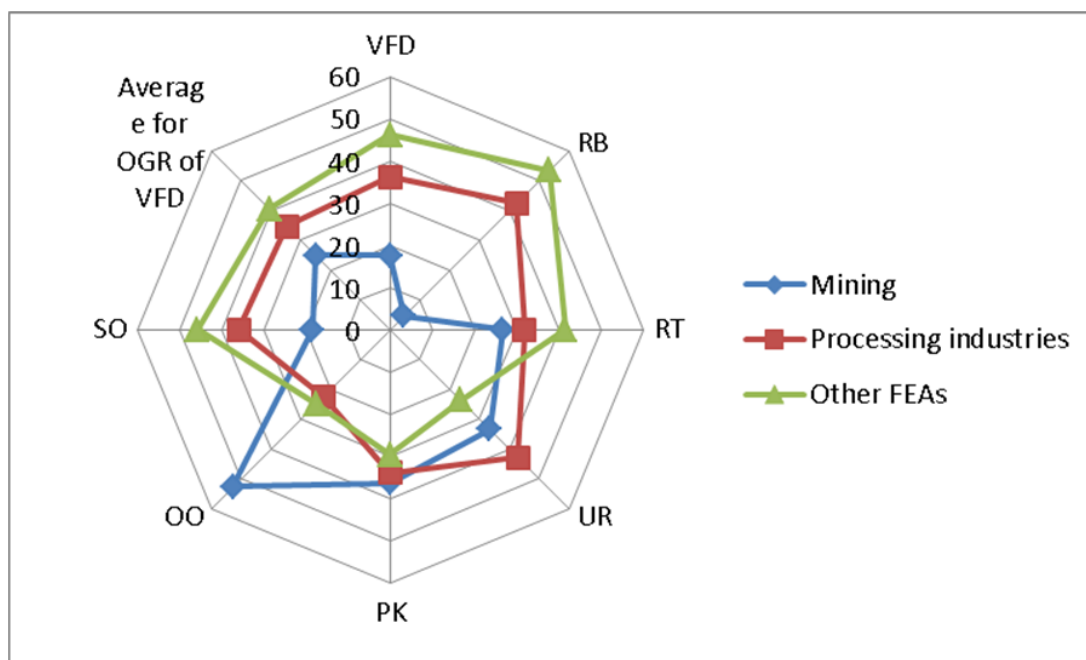


Fig. 5. The Structure of Turnover of Organizations in the Oil and Gas Regions of the Volga Federal District by Main Types of Economic Activity in 2023, % of the Total

Source: Compiled by the author according to Rosstat. Regions of Russia. Socio-economic Indicators. 2024. Statistical Collection. Rosstat. Moscow; 2024. 1081 p.

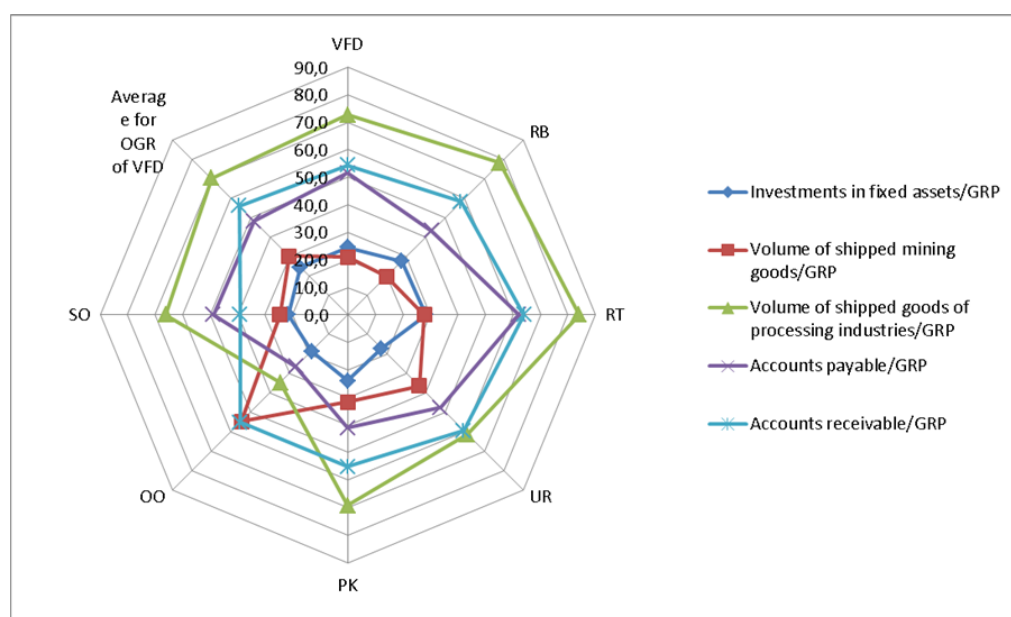


Fig. 6. The Ratio of Investments in Fixed Capital, the Volume of the Goods Shipped from Mining Activities and the Volume of Shipped Goods from Manufacturing Industries, Accounts Payable and Receivable to the GRP of the Oil and Gas Regions of the Volga Federal District, in %

Source: Compiled by the author according to Rosstat. Regions of Russia. Socio-economic Indicators. 2024. Statistical Collection. Rosstat. Moscow; 2024. 1081 p.

Table 1

**The Results of a One-way Analysis of Variance of Financial Indicators
of the Economic Security of Oil and Gas Regions**

The source of the variation	SS	df	MS	F	P-value	F critical
Between regions in terms of financial and economic security indicators						
Between groups	221.27	5	44.25	0.07	1.00	3.11
Within groups	8113.71	12	676.14			
Total	8334.98	17				
Between financial indicators of economic security by region						
Between groups	10080.95	4	2520.24	24.64	9.24704E-10	2.64
Within groups	3580.34	35	102.30			
Total	13661.29	39				

Source: Compiled by the author according to Rosstat. Regions of Russia. Socio-economic Indicators. 2024. Statistical Collection. Rosstat. Moscow; 2024. 1081 p.

Table 2

**Data for Cluster Analysis of Financial Indicators of Economic Security
of Oil and Gas Regions**

Region	1	2	3	4	5	6
	RB	RT	UR	PR	OR	SR
Investments in fixed assets/GRP, %	27.6	28.2	17.2	24.0	18.7	21.7
Accounts payable/GRP, %	43.2	62.1	47.6	41.1	26.6	48.8

Source: Compiled by the author according to Rosstat. Regions of Russia. Socio-economic Indicators. 2024. Statistical Collection. Rosstat. Moscow; 2024. 1081 p.

supplement the results with their cluster analysis (*Tables 1 and 2, Fig. 7*).

According to the results of the hierarchical clustering of the ratios of investments in fixed assets and accounts payable to GRP (the main financial indicators of economic security in oil and gas regions), the Republic of Bashkortostan and Perm Territory have the closest levels of financial component of economic security. The degree of similarity between these two

regions is 4.17. This may be explained by the data in *Fig. 6*. The similarity between these entities is indicated by the high ratio of the volume of goods shipped from manufacturing industries compared to GRP, and the low ratio of goods shipped from mining activities compared to GRP. The Udmurt Republic and Samara Region have similar levels of financial component of economic security, with a degree of similarity of 4.66. This can

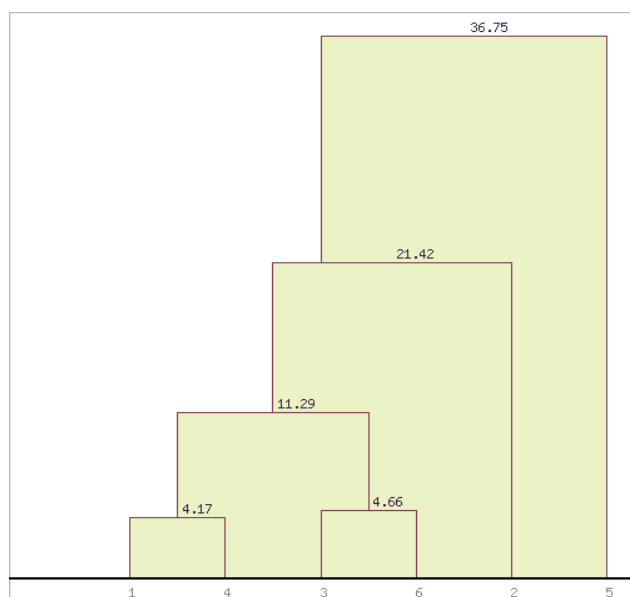


Fig. 7. Hierarchical Clustering of Financial Indicators of Economic Security in the Oil and Gas Regions of the Volga Federal District

Source: Compiled by the author according to Rosstat. Regions of Russia. Socio-economic Indicators. 2024. Statistical Collection. Rosstat. Moscow; 2024. 1081 p.

be explained by their commonalities in terms of investments in fixed assets and their relationship to GRP (gross regional product), as well as by the low percentage of unprofitable organizations in the mining industry (Fig. 3). In the context of the oil and financial embargo imposed by sanctions, the hierarchical clustering of oil and gas regions based on financial indicators of their economic security can help to determine the contours of an interregional horizontal industrial policy aimed at countering crisis situations that reduce regional economic security. This can also help to develop strategies to protect the national security system. The Republic of Tatarstan stands out for its individual aspects of the financial component of economic security. This is probably due to its high logistic, innovative and industrial potential, as well as its focus on protecting the regional economy of Tatneft, the oil and gas company, and related industries.

Orenburg region is characterized by several significant barriers to interregional

industrial integration, which make it difficult to develop strategies for protecting national interests and increasing the “safety margin” of financial thresholds for regional economic security. This is due to the fact that the region has a relatively low level of responsibility for the oil and gas chemical complex, which is highly diversified in terms of the number of enterprises and their forms of ownership. This circumstance and the high raw materials orientation of Orenburg region complicates its interregional financial and industrial cooperation, rationalizing the economic security infrastructure along the entire length of the value chain, from production of coke and petroleum products to chemical fibers and materials, medicine and goods for medical purposes to plastic and rubber products.

CONCLUSIONS

The volume of trade in industrial organizations in the oil and gas industry, as well as the trade in oil and gas products and their derivatives, is of significant importance to the regional domestic and foreign trade turnover. The financial results of these organizations are important indicators of the economic security of the spatially localized economic systems in the region.

Under the current conditions of sanctions, the financial performance of organizations in the oil and gas sector and related industries may improve as a result of increased added value, expansion of product range, and development of innovative and high-tech industries. This could lead to an increase in the production of products that are characteristic of the regional economic specialization in oil and gas. The growth of financial results of organizations can ensure an increase in the level of regional economic security as a result of the development of an inclusive type of industrial growth. Inclusive industrial development is understood as

providing producers of various industries and various production functions with equal opportunities to ensure advanced industrial development. In the oil and gas region, inclusive industrial development can be achieved by attracting highly profitable revenues that generate significant profits for federal and regional budgets, as well as for vertically integrated oil and gas companies. These revenues can be used to support other sectors of the national economy, including strategic industries and innovative small and medium-sized businesses, through venture investments.

To achieve this goal, it is essential to develop a methodology for managing the financial system in the oil and gas sector

that takes into account various challenges, such as the changing global fuel and energy mix, the potential for an embargo on non-renewable imports, the rapid expansion of engineering projects within the industry, and imbalances within monetary and fiscal systems. The organization of an efficient system of regional finance, which is a crucial factor for the innovative industrial development of the oil and gas sector, creates opportunities for the evolution of economic growth mechanisms and the establishment of a unified network of interregional financial and industrial relationships within the federal state. This in turn leads to additional opportunities for enhancing the system of national economic security.

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