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ASSESSMENT OF REGIONAL-INDUSTRIAL COMPLEXES' VULNERABILITY TO EXPORT SANCTION RESTRICTIONS

AVALIAÇÃO DA VULNERABILIDADE DOS COMPLEXOS INDUSTRIAIS REGIONAIS ÀS RESTRIÇÕES À EXPORTAÇÃO

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ABSTRACT

Introduction: Export potential is vital for economic development, shaping a nation's competitiveness in the global market. This study examines export dependency in regional-industrial complexes within the Volga Federal District, highlighting vulnerabilities under external restrictions.

Objective: To assess risks associated with export dependency and propose state policy strategies to mitigate sanction impacts and promote sustainable development.

Methodology: Using data from 2012-2021, export and production statistics were analyzed to calculate economic sectors' dependency in the Volga Federal District. Indicators were adjusted to reflect changes in international trade, considering regional economic classifications.

Results: Sectors such as chemicals, fertilizers, and wood products exhibit high export dependency, making them vulnerable to sanctions. The integration of these sectors into international supply chains was analyzed, revealing challenges in redirecting markets and enhancing economic sustainability.

Conclusion: The analysis identified priority sectors for government support. Adaptive policies can mitigate risks associated with trade restrictions, ensuring continued regional economic growth.

Keywords: Industrial Complexes, Sanction Restrictions, Economic Sustainability, Supply Chains.

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RESUMO

Introdução: O potencial de exportação é crucial para o desenvolvimento econômico, moldando a competitividade de uma nação no mercado global. Este estudo analisa a dependência de exportação dos complexos industriais regionais no Distrito Federal do Volga, identificando vulnerabilidades sob restrições externas.

Objetivo: Avaliar os riscos associados à dependência de exportação e propor estratégias de política estatal para mitigar os impactos de sanções e promover o desenvolvimento sustentável.

Metodologia: Utilizando dados de 2012-2021, foram analisadas estatísticas de exportação e produção para calcular a dependência de setores econômicos no Distrito Federal do Volga. Os indicadores foram ajustados às mudanças no comércio internacional, considerando as classificações econômicas regionais.

Resultados: Setores como produtos químicos, fertilizantes e madeira apresentam alta dependência de exportação, tornando-os vulneráveis a sanções. A integração dos setores em cadeias de suprimento internacionais foi avaliada, destacando os desafios para redirecionar mercados e fortalecer a sustentabilidade econômica.

Conclusão: A análise identificou setores prioritários para suporte governamental. Políticas adaptativas podem reduzir os riscos associados às restrições comerciais, assegurando a continuidade do crescimento econômico regional.

Palavras-chave: Complexos Industriais, Restrições de Sanções, Sustentabilidade Econômica, Cadeias de Suprimento.

1 INTRODUCTION

The current trends in escalating external pressure from Western countries through the 13th and anticipated 14th sanction packages in 2024 heighten the threats to maintaining consistent export-import operations at the regional-industrial level of Russia's national economy. The double sanctions applied to major transnational companies trading with Russia disrupt established foreign economic activity volumes. Identifying such risks is essential for analyzing prospects for the sustainable development of economic sectors in the renewed geo-economic agenda. This underscores the importance of research focused on developing methodological tools for assessing the import dependence of regional-industrial complexes. This issue is particularly significant for industrially developed regions with a high level of integration into international supply chains.

It is important to emphasize that developing methodological approaches to study the impact of export-import localization on the economic stability of regional-industrial complexes requires a systematic approach. This entails applying and refining the

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methods of descriptive and economic-statistical analysis. The study presents an original approach to developing corresponding tools, primarily assessing the resilience of industrial sectors in the region's economy to sanction pressures that localize export flows.

2 LITERATURE REVIEW

Despite the in-depth exploration of economic dynamics concepts and models (Bourguignon, 2003), the modern institutional environment shaped by artificially restricting market economy laws (such as sanction barriers) limits the potential of traditional economic growth models. In these new conditions, it becomes vital to seek economic development models adapted to the changing agenda. Echoing the views in (Osipov, 2014; Bas & Strauss-Kahn, 2014; Deringer et al., 2021) non-market development mechanisms hinder traditional economic growth models and undermine their practical application potential. Therefore, these models require adaptation to the new socio-economic environment. This perspective is especially relevant in the current landscape of economic relations arising in transnational supply chain cooperation across countries. Sanctions that limit foreign trade ties call for new conceptual approaches to developing economic systems integrated into sanction conflicts. Such a perspective is important at the regional-industrial research level. Thus, there is an urgent need to develop and expand the theoretical and methodological foundations for studying the sustainable development of economic systems in a transforming institutional and market environment.

International sanctions have been practiced globally since the mid-1960s (Figure 1), and publications and research on their impact on economic dynamics stability are widely available. They can be divided into two main groups. The first includes publications focusing on descriptive analysis methods, aimed at systematizing observed trends and developing heuristic assessments and conclusions. The second group comprises studies employing mathematical and statistical data analysis methods relevant to this study's focus. The distinctive feature and the main advantage of the latter is the increased objectivity in studying the impact of external sanctions on economic systems' stability. This article reasonably focuses on developing methodological tools involving quantitative analysis methods and regional-industrial components.

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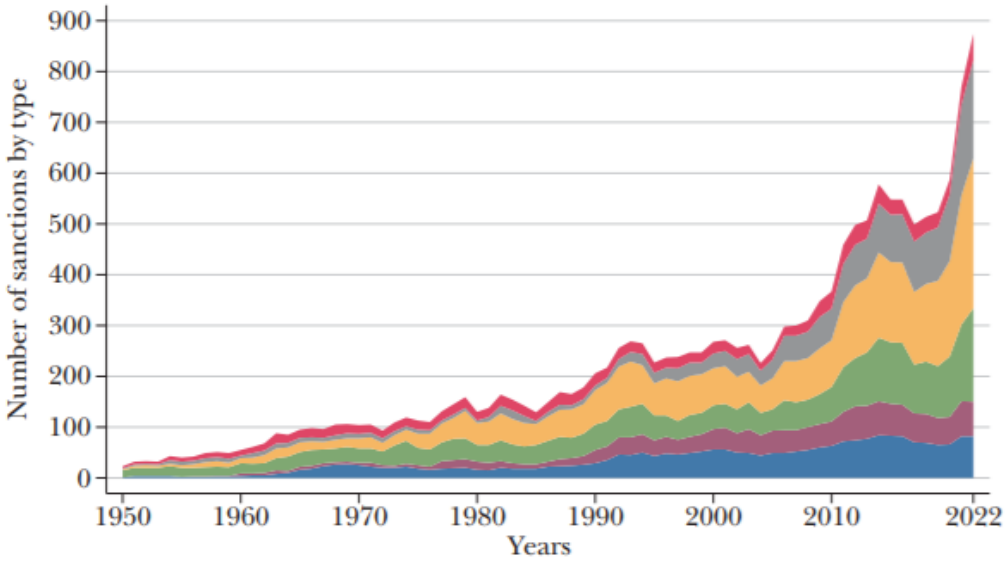

Figure 1. Evolution of sanction pressure on national economies globally from 1950 to 2022
Source: Developed based on data from (Morgan, Bapat, & Kobayashi, 2021)

In reviewing academic works on the issues, it is noteworthy that contemporary researchers dedicate significant attention to aspects of sustainable development of economic systems in an evolving foreign economic environment. Theories and research methods addressing these issues at the macro level are reflected in (Sukharev, 2023; Chernova, 2017; Yaroshevich & Migunov, 2023; Yelshin et al., 2022; Grimme et al., 2021; He & Huang, 2022; Irwin, 2021; Alessandria et al., 2021; Leibovici & Waugh, 2019; Soderbery, 2015; Noelle, 2021). However, the prospects for developing regional and industry-level economic systems receive comparatively less attention in scientific literature, despite it being an important research direction for academic inquiry and practical solutions. Although less attention has been devoted to this research perspective, some studies examine the regional adaptation of economic systems to changes in foreign trade relations, as discussed in (Uvarova et al., 2022; Adewale, 2017; Broocks & Biesebroeck, 2017).

Studies exploring the impact of sanctions that limit the export-import potential of regional-industry complexes can be found in (Zolotukhina, 2017; Kazikhanov, 2018; Tretyak, 2018; Fang et al., 2021; Cardero & Galindo, 2005; Hoang & Breugelmans, 2023; Karuppiah & Sankaranarayanan, 2023; Koren et al., 2022; Bali & Rapelanoro, 2021). Although research on the sustainable development of regional-industry complexes amidst the transformation of external cooperative ties exists, there remains a need for further development of methodological tools in this area. This need is due to the limited

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elaboration of methodological approaches and the necessity to adapt existing development mechanisms to a new configuration of transformational processes caused by non-market sanction restrictions.

3 METHODS

Considering the issues raised in this study regarding the impact of foreign economic transformation on the stability of regional-industry complexes, a key aspect is determining the export dependence of economic sectors within the regional subjects under investigation. This study proposes assessing this macro-parameter by comparing pre-sanction (2022) export volumes in regional economic activities to final product output or closely related macro-indicators. Depending on the research level applied to the object, a corresponding methodological approach is developed to calculate this parameter, following the previously described logic of comparing export volumes to production output (Table 1).

Table 1. Methodological tools for assessing export dependence based on the research focus and studied objects

Research object: enterprises and organizations of the district's regions	Types of economic activities (TEA) of the district's regions	TEA in industrial production of the district's regions
Share of regional enterprises and organizations' exports in the total GRP volume $Iexp\_reg = \frac{Volume\ export}{GRP}$	Share of export in TNVED (commodity nomenclature of foreign economic activity) in the volume of produced goods according to OKPD (all-Russian classifier of products by types of economic activities) $Iexp_{TNVED} = \frac{TNVED\ export\ volume}{OKPD\ volume\ of\ produced\ goods}$	Share of industrial sector exports in the total volume of produced goods $Iexp_{TEA(ind)} = \frac{Export\ volume}{Volume\ of\ produced\ goods}$

Source: Developed by the authors

Considering that the monitoring of foreign economic activity is conducted based on the main types of the commodity nomenclature of foreign economic activity of the Eurasian Economic Union (TNVED), the expert assessment of the share of exports in the volume of produced goods was conducted according to it. Given that production statistics are kept according to the all-Russian national classifier of products by types of economic activities (OKPD), the transition keys developed by the Ministry of Economic

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Development of Russia were used for comparability of calculations (All-Russian classifiers assigned to the Ministry of Economic Development of Russia, n.d.). These transition keys (comparison tables) were developed based on data from the Eurostat agency of the European Commission on the correlation of the codes of the Harmonized System of Goods Description and Coding (HS) of 2022 and the Statistical Classification of Products by Activity in the European Union (CPA) of 2008. The keys reflect possible correspondences between the first six-digit codes of the EAEU TNVED (based on HS) and the codes of OKPD 2 (based on CP 2A) as of January 1, 2022. The proposed correspondences are not exhaustive and are intended to serve as auxiliary material to facilitate the work on establishing possible correlation variants between the classifiers for the relevant categories of goods. Thus, the results of calculating the export share in the volume of produced goods represent an expert evaluation with a margin of error.

4 RESULTS AND DISCUSSION

The methodological approach was tested using the regions of the Volga Federal District. For the time series, forming the basis for assessments and subsequent analysis, the years 2012-2021 were selected. The upper limit of the time series is determined by the patchiness of statistical data characterizing trends in foreign economic activity at the regional and sectoral levels in 2022-2024. The upper limit of the time series is determined by the research focus of the study, aimed at determining the potential for sustainable development of Russian regions based on the assessment of pre-sanction parameters of their export dependence. This approach allows for a holistic view of the initial parameters for entering a zone of increased turbulence, caused by sanction pressure on the Russian national economy.

According to customs trade statistics, the foreign trade turnover in the Volga Federal District in 2021 amounted to 61.499 billion US dollars, representing a 37% increase compared to 2020. Exports grew by 42.4% and reached 44.245 billion US dollars, while imports increased by 24.7%, totaling 17.254 billion US dollars (Figure 2).

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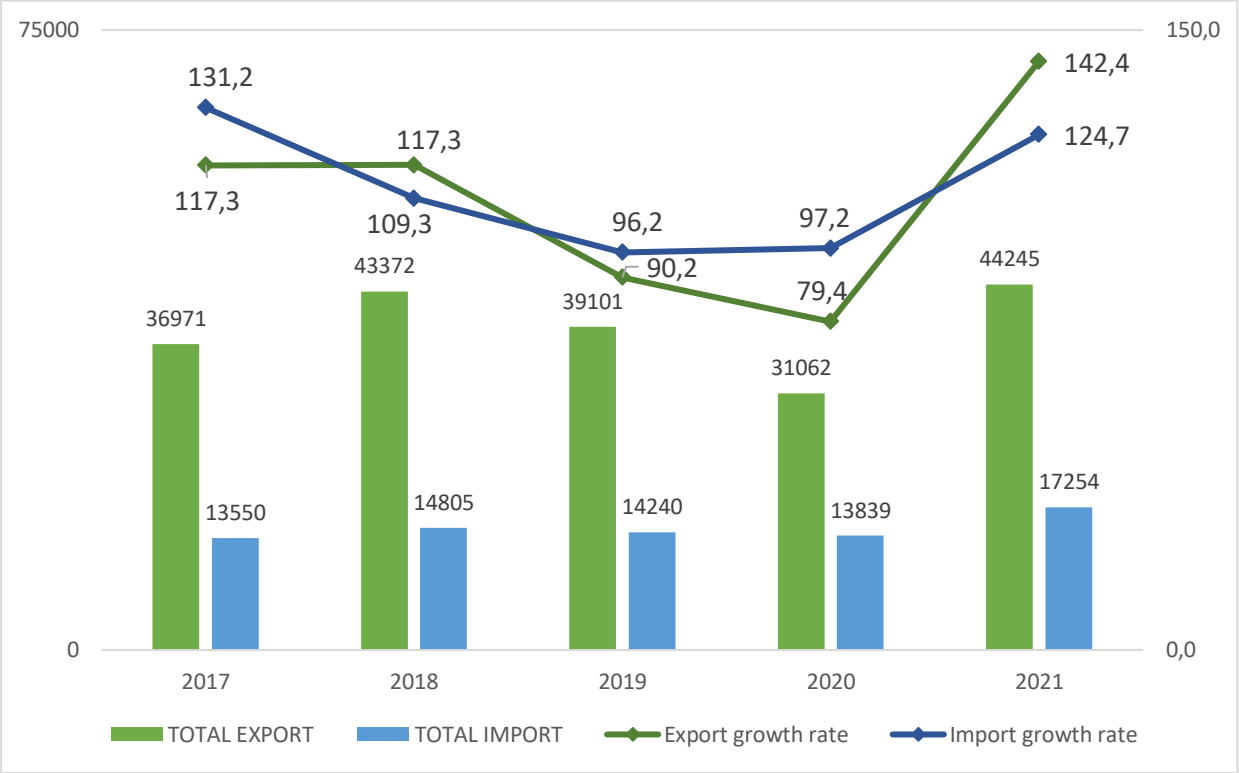

Figure 2. Dynamics of export and import in the Volga Federal District (million USD)

When examining the share of exports in the gross product of the Volga Federal District, a declining trend from 2012 to 2021 is evident, reaching an estimated 19% by the end of the period, a decrease of 8.5 percentage points. For comparison, the national average in 2021 stood at approximately 30%, with a decline of 3 percentage points over the same period. Due to sanctions, other restrictions, and international prices, the share of exports in the national economy structure fell to 23% by 2023.

Among the regions in the Volga Federal District, as of 2021, the highest export share in the GRP was found in three regions: Perm Krai (33%), the Nizhny Novgorod Region (25%), and the Republic of Tatarstan (25%). The group with export shares between 10 and 20% included six regions: the Kirov Region at 19%, the Samara Region at 17.7%, the Saratov Region at 16.5%, the Orenburg Region at 13.7%, the Republic of Bashkortostan at 13.6%, and the Republic of Mari El at 10.6%. In the remaining five regions, the export share in the GRP ranged from 4.9 to 9.1% (Table 2 and Figure 3).

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Table 2. Share of exports in the GRP of the Volga Federal District regions, %

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Volga Federal District	**27.5**	**25.9**	**26.8**	**25.6**	**18.9**	**18.2**	**20.6**	**18.1**	**16.5**	**19.0**
Republic of Bashkortostan	35.9	40.1	42.4	35.0	26.9	16.7	16.2	15.3	13.5	13.6
Republic of Mari El	16.0	11.9	6.2	14.7	8.6	11.1	15.3	11.0	6.1	10.6
Republic of Mordovia	4.9	3.2	5.1	4.1	4.7	5.3	7.4	6.6	6.8	9.1
Republic of Tatarstan	48.1	45.9	42.1	37.5	30.1	33.5	37.1	29.6	24.3	25.2
Udmurt Republic	17.8	9.9	11.2	8.1	6.0	3.2	3.7	5.5	5.3	5.1
Chuvash Republic	3.8	3.2	2.9	3.5	3.4	3.4	4.1	3.8	5.2	5.6
Perm Krai	31.3	26.8	31.7	36.6	24.4	23.3	23.8	25.0	23.3	33.2
Kirov Region	16.4	14.6	15.7	19.7	15.1	14.2	15.9	13.5	15.0	19.0
Nizhny Novgorod Region	22.3	19.3	21.1	17.6	14.1	16.3	23.0	19.8	22.1	25.3
Orenburg Region	18.4	15.4	16.5	19.5	17.6	16.4	16.4	12.0	12.5	13.7
Penza Region	3.9	2.6	2.5	5.0	3.8	3.8	4.6	4.4	6.0	4.9
Samara Region	22.0	27.4	33.7	32.7	18.7	17.1	19.5	17.9	16.9	17.7
Saratov Region	25.5	15.9	9.4	13.5	10.8	10.4	13.0	10.9	11.6	16.5
Ulyanovsk Region	6.1	5.1	8.1	9.6	7.7	10.7	12.8	17.1	8.2	8.5
Reference: Russian Federatio	*32.7*	*31.0*	*32.4*	*32.0*	*25.8*	*26.2*	*31.4*	*28.8*	*25.8*	*29.7*

Source: Calculated by the authors based on data from the Federal Customs Service (Reference and analytical materials, n.d.; Federal State Statistics Service, n.d.)

An analysis of the ratio of goods export volume to shipped production volume in the Volga Federal District shows a similar downward trend from 2012 to 2021, decreasing from 27.7 to 19.6%, a drop of 8.1 percentage points (Table 3 and Figure 3). Nationwide, the decline was smaller, at 4.4 percentage points, with this indicator remaining at 38.3%.

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Table 3. Goods exports in relation to shipped production volume in the regions of the Volga Federal District, %

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Volga Federal District	**27.7**	**26.7**	**28.4**	**26.2**	**21.0**	**19.5**	**21.1**	**18.9**	**17.6**	**19.6**
Republic of Bashkortostan	36.0	38.7	45.6	35.8	29.3	17.0	16.4	15.3	14.4	12.9
Republic of Mari El	19.5	16.9	7.7	16.7	10.1	11.7	16.8	12.4	7.3	12.1
Republic of Mordovia	5.9	4.1	6.8	5.1	7.0	6.9	8.6	7.8	7.0	8.9
Republic of Tatarstan	47.0	46.0	41.6	36.2	30.9	33.0	34.7	29.6	23.0	21.6
Udmurt Republic	20.6	11.4	12.9	8.9	6.4	3.4	3.7	5.6	6.0	5.7
Chuvash Republic	5.4	4.7	4.4	5.0	5.2	5.0	5.6	5.0	6.9	7.9
Perm Krai	25.3	21.7	26.6	31.1	22.8	21.2	20.3	21.9	21.2	31.7
Kirov Region	21.3	19.6	21.0	24.4	20.2	19.2	20.0	17.2	18.5	22.6
Nizhny Novgorod Region	19.1	17.2	19.5	15.7	14.4	16.5	22.6	19.5	22.4	29.5
Orenburg Region	19.1	16.4	18.7	20.5	21.4	18.7	17.9	13.2	14.7	14.8
Penza Region	6.9	4.8	4.6	8.6	6.5	6.4	8.3	7.8	9.4	7.5
Samara Region	20.1	26.6	33.3	32.0	19.7	17.7	19.5	17.7	17.2	18.3
Saratov Region	35.1	23.8	13.8	18.1	16.2	15.5	18.1	15.6	16.9	21.1
Ulyanovsk Region	7.8	6.8	10.1	10.7	10.5	13.4	16.4	19.8	10.3	10.9
Reference: Russia	**42.7**	**41.4**	**43.6**	**41.1**	**35.9**	**35.3**	**40.6**	**37.6**	**33.7**	**38.3**

Source: Calculated by the authors based on data from the Federal Customs Service (Reference and analytical materials, n.d.; Federal State Statistics Service, n.d.)

Figure 3 presents a grouping of regions in the Volga Federal District for 2021 according to two analyzed indicators: the ratio of exports to gross product and the ratio of exports to the volume of goods produced, services rendered, and work completed by the regions (Figure 3).

Share of exports in the GRP, %	Export of goods as a percentage of the volume of shipped products, %

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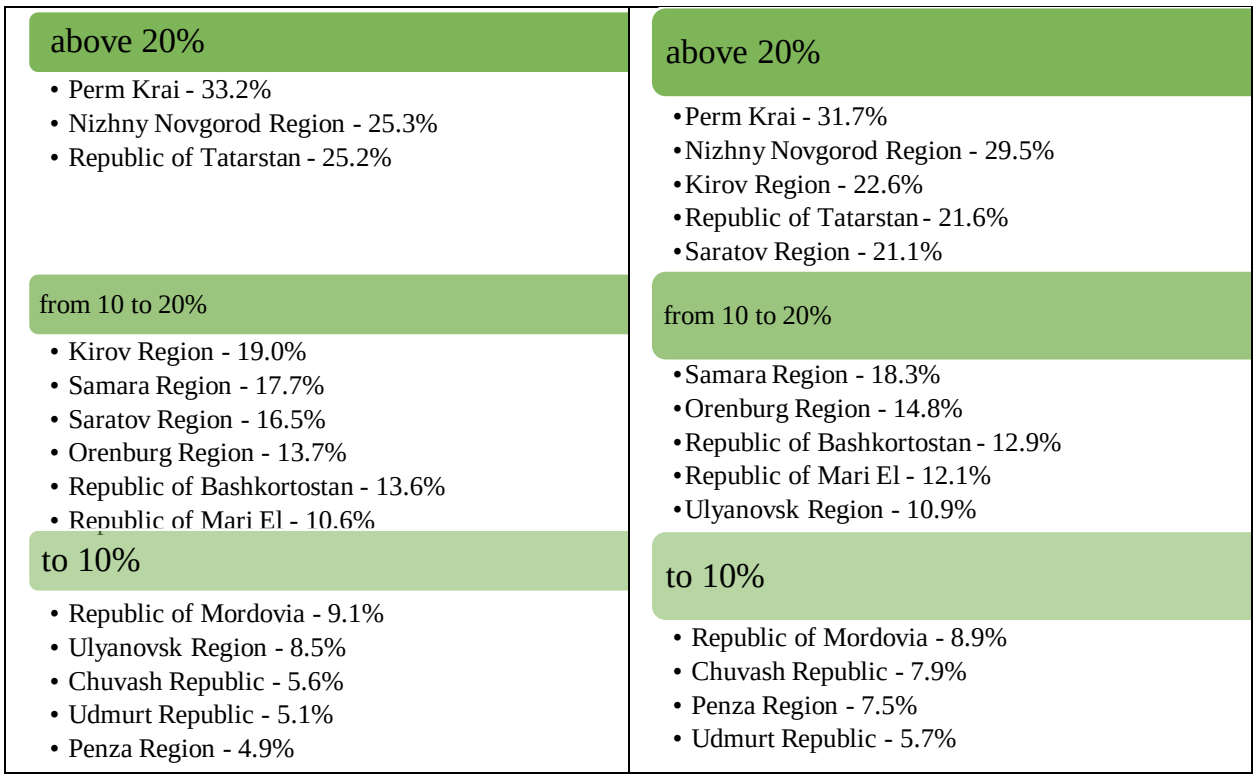

Figure 3. Grouping of Volga Federal District regions in 2021 by export-to-GDP ratio and export-to-output ratio, %

Source: Calculated by the authors based on Federal Customs Service data (Reference and analytical materials, n.d.; Federal State Statistics Service, n.d.)

To provide a more detailed analysis of the export dependence parameters of the studied regional group, further assessments were carried out, revealing the export orientation characteristics of the Volga Federal District by economic activity sectors. To assess the share of exports in production volume across the main types of exported products of the Volga Federal District, the transition keys between the EAEU TNVED and the OKPD were used. The comparison and summation of production volumes were conducted based on the nomenclature presented in the Unified Interdepartmental Information and Statistical System (UIISS). The evaluation was based on the main types of commodity nomenclature of foreign economic activity in the Volga Federal District, for which information was available in the UIISS.

The evaluations indicate a significant level of differentiation in the economic sectors of the Volga Federal District in terms of export dependence (Tables 5 and 6). Given the unprecedented sanctions and restrictions on foreign trade operations, it is reasonable to focus on economic activities with high export dependence. However, significant export dependence may not necessarily mean vulnerability for the economic sectors. This is because export deliveries may be concentrated in so-called friendly countries.

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Nonetheless, considering that the share of unfriendly countries in Volga Federal District's exports significantly dominates over friendly countries (Table 4), extrapolating conclusions and focusing on sectors with high export dependence seems justified.

Table 4. Export-import operations of the Volga Federal District regions by friendly and unfriendly countries, 2021

	Share of unfriendly countries in import volume, %	Volume of imports from unfriendly countries, million USD	Volume of imports from unfriendly countries, %	Share of unfriendly countries in export volume, %	Volume of exports to unfriendly countries, million USD	Balance, million USD	Export to import ratio, %
Russia	51.3	150,588.9	100	55.8	274,522.8	123,933.9	182.3
Volga Federal District	56.7	9,789.2	6.5	49.3	21,810.4	12,021.2	222.8

Source: Developed based on data (Calculated by the authors based on data from the Federal Customs Service, n.d.)

It is impossible to definitively state whether the decline in the export-to-GDP ratio is positive or negative. This is not only a consequence of recent geopolitical events but also of the internal policies of individual countries. In recent decades, the Russian economy has been export-oriented. In the context of structural changes, an important factor is domestic demand; however, this does not imply a large-scale reorientation of export capacities.

Based on the presented assumptions, the sectors of the Volga Federal District with lower development sustainability and thus vulnerable sectors of the economy include (Table 5):

- Chemical product manufacturing,
- Fertilizer production,
- Production of ferrous metal products,
- Wood product manufacturing.

The export dependence of these economic activities reaches extreme values, ranging from 41 to 70% of the produced volume.

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Table 5. Export-vulnerable economic activities of the Volga Federal District

EAEU TNVED	Product name	Unit of measurement	Export volume		Production volume		Export-to-production ratio	
			2020	2,021	2020	2021	2020	2021
31	Fertilizers	thousand t	15,390.1	17,186.6	24,609.7	26,236.0	62.5	65.5
4002	Synthetic rubber and factice derived from oils, in primary forms or as plates, sheets, strips, or bands; mixtures of any product of heading 4001 with any product of heading 4002, in primary forms or as plates or sheets	t	755,471.2	833,281.3	1,127,968.2	1,259,360.0	67.0	66.2
4412	Plywood, veneered panels, and similar laminated wood	m^3	872,712	953,426	1,450,291.0	1,608,981.0	60.2	59.3
48	Paper and cardboard; articles made from paper pulp, paper, or cardboard	t	724,278.3	819,548.8	1,716,522.3	1,894,901.7	42.2	43.3
7201	Refined and mirror pig iron in ingots, billets, or other primary forms	t	1,323,576.5	1,295,101.1	2,313,100.0	2,414,100.0	57.2	53.6
7213	Hot-rolled bars in freely wound coils made of iron or unalloyed steel	t	48,238.9	167,485.5	338,962.0	401,547.0	14.2	41.7
7306	Pipes, tubes, and other hollow profiles (e.g., with an open seam or welded, riveted, or joined similarly), made of ferrous metals	t	220,485.4	260,461.2	473,628	476,046	46.6	54.7

Source: calculated by the authors based on data from the Federal Customs Service (Reference and analytical materials and data from the Federal State Statistics Service, n.d.)

Moderate yet significant values of vulnerability within the framework of export dependence are demonstrated by the following sectors in the Volga Federal District (Table 6):

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- production of timber;
- production of wood-based panel products;
- production of polymers;
- oil extraction and production of petroleum products.

The coefficient values, measured as the ratio of export deliveries in these sectors to the production volume, range from 23 to 32%.

Table 6. Types of economic activities with a high level of export dependence

EAEU TNVED	Product name	Unit of measurement	Export volume		Production volume		Export-to-production ratio	
			2020	2 021	2020	2021	2020	2021
2710	Petroleum and petroleum products derived from bituminous minerals, other than crude; products not elsewhere specified or included, containing 70% or more by weight of petroleum or petroleum products derived from bituminous mineral	m^3	20,044.9	20,572.7	83,905.1	88,679.4	23.9	23.2
3904	Polyvinyl chloride or other halogenated olefin polymers, in primary forms	t	138,559.1	154,564.8	640,201.6	662,194.9	21.6	23.3
4407	Wood materials obtained by sawing or splitting along the grain, planing or peeling, untreated or treated by planing, sanding, with or without end-jointing, with a thickness of more than 6 mm	t	851,467.5	787,298.6	2,170,756.1	2,459,726.5	39.2	32.0
4410	Petroleum and petroleum products derived from bituminous minerals, other than crude; products not elsewhere specified or included, containing 70% or more by weight of petroleum or petroleum products derived from bituminous minerals	m^3	443,424	502,873	1,849,036.0	2,108,121.0	24.0	23.9

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EAEU TNVED	Product name	Unit of measurement	Export volume		Production volume		Export-to-production ratio	
			2020	2021	2020	2021	2020	2021
4805	Uncoated paper and paperboard, other, in rolls or sheets, either not further worked or processed as stated in Note 3 to this group	t	185,376.1	383,534.0	1,060,162	1,380,522	17.5	27.8

Source: Calculated by the authors based on data from the Federal Customs Service (Reference and analytical materials and data from the Federal State Statistics Service, n.d.)

Finally, the third group of export-dependent regional-industrial complexes is formed by types of economic activity with a low level of vulnerability to the localization of export-import operations within the framework of sanctions opposition (Table 7).

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Table 7. Types of economic activity with increased export dependence

EAEU TNVED	Product name	Unit of measurement	Export volume		Production volume		Export-to-production ratio	
			2020	2021	2020	2021	2020	2021
270900	Crude oil and crude petroleum products derived from bituminous minerals	thousand t	12,411.3	9,900.1	106,608.8	111,240.4	11.6	8.9
28	Inorganic chemicals; inorganic or organic compounds of precious metals, rare-earth metals, radioactive elements, or isotopes	t	3,839,321.7	4,153,720.4	22,110,419.9	23,104,263.7	17.4	18.0
29	Organic chemical compounds	t	1,935,062.9	1,860,902.2	14,707,865.4	14,558,664.0	13.2	12.8
39	Plastics and articles thereof	t	888,864.3	948,007.4	5,155,967.7	5,417,912.0	17.2	17.5
3901	Ethylene polymers in primary forms.	t	198,871.2	185,883.9	1,224,744.4	1,176,461.9	16.2	15.8
3907	Polyacetals, other simple polyesters, and epoxy resins in primary forms; polycarbonates, alkyd resins, complex polyallyl ethers, and other complex polyesters in primary forms	t	65,531.7	67,925.0	434,605.7	445,064.2	15.1	15.3

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3920	Plates, sheets, film, and strips or tapes, other, made of plastics, non-porous and non-reinforced, non-laminated, without backing and not bonded to other materials similarly	t	45,080.6	38,991.2	439,609.3	502,560.6	10.3	7.8
3921	Plates, sheets, film, and strips or tapes made of plastics, other	t	10,041.3	15,951.6	180,578.7	224,219.8	5.6	7.1
3926	Other articles made of plastics and articles made of other materials of commodity items 3901-3914	t	7,434.7	7,696.4	60,374.7	53,457.0	12.3	14.4
4011	New pneumatic rubber tires and inner tubes	thousand units	3,600.0	2,890.5	16,436.7	20,221.2	21.9	14.3
4406	Wooden railway or tramway ties	m^3	8,063.0	7,696.0	2,978,390	3,429,420	0.27	0.22
4801000000	Newspaper paper in rolls or sheets	t	402,049.5	260,142.8	543,689	370,676	73.9	70.2
4802	Uncoated paper and paperboard, used for writing, printing, or other	t	26,283.0	28,700.9	209,630	232,441	12.5	12.3

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	graphic purposes, and unperforated cards and unperforated paper ribbons, in rolls or rectangular (including square) sheets of any size, except for commodity paper							
4804	Uncoated kraft paper and kraft cardboard, in rolls or sheets, except those specified in commodity items 4802 or 4803	t	47,787.3	53,019.9	305,975	319,236	15.6	16.6
72	Ferrous metals	t	2,254,322.7	2,184,263.1	13,064,826.0	14,357,917.0	17.3	15.2
7214	Other bars of iron or nonalloy steel, not further worked except for forging, hot-rolling, hot-drawing, or hot-extruding, but including twisted after rolling	t	258,220.2	180,732.5	1,562,282.0	1,644,108.0	16.5	11.0
73	Products made of ferrous metals	t	454,840.3	473,927.9	3,556,355.5	3,673,002.0	12.8	12.9
7304	Pipes, tubes, and hollow profiles,	t	16,804.9	21,102.0	621,268	557,717	2.7	3.8

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	seamless, made of ferrous metals (excluding cast iron)							
7305	Other pipes and tubes (e.g., welded, riveted, or otherwise joined similarly), with a round cross-section, having an outside diameter greater than 406.4 mm, made of ferrous metals	t	47,547.2	57,634.9	711,016	1,015,985	6.7	5.7
8708	Parts and accessories of motor vehicles classified under commodity positions 8701-8705	thousand USD	222,518.4	281,702.3	2,198,600.5	2,707,502.1	10.1	10.4

Source: Calculated by the authors based on data from the Federal Customs Service (Reference and analytical materials and data from the Federal State Statistics Service, n.d.)

Overall, based on the results of the conducted research, it should be stated that there are sectors in the Volga Federal District (PFO) that require increased attention from government authorities in order to mitigate the risks of disruptions to their development under external pressure (Tables 5, 6). Moreover, using risk management terminology, the level of these risks, in terms of maintaining regional economic growth dynamics, should be considered critical. This is due to the high level of reliance of several economic sectors on external markets, which are currently undergoing transformation and uncertainty.

The argument for the need to implement priority support measures from the state for the export-vulnerable sectors of the PFO economy, which are included in the first and second critical groups (Tables 5, 6), is strengthened by data from the Center for Conjuncture Studies

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of the Higher School of Economics (Composite indicators of the export climate in the manufacturing industry, n.d.). According to expert assessments, "more than a third of enterprise managers considered entering new markets for product sales as one of the factors limiting production activity in 2023". A significant aspect is that the sectors of the PFO economy with a high level of export dependence (Table 5) belong (according to Figure 4) to a group of enterprises with low optimism regarding the possibility of redirecting exports to new external markets.

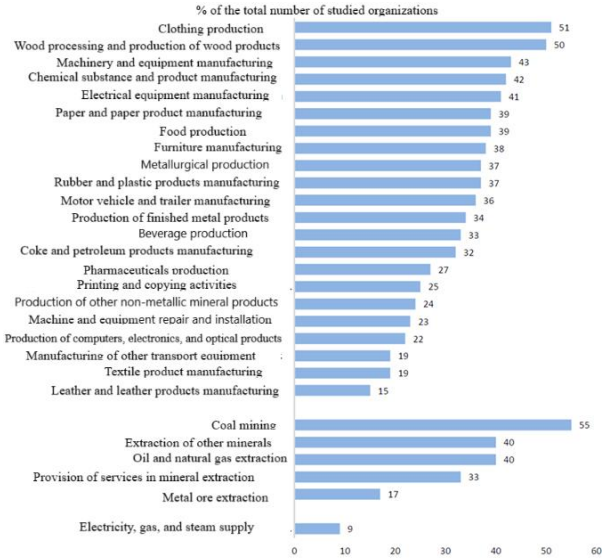

Figure 4. Level of difficulty in accessing new markets for product sales
Source: Composite indicators of the export climate in the manufacturing industry, n.d.

5 CONCLUSIONS

The results summarize assessments of the export dependency of regional and sectoral complexes in the Volga Federal District, identifying risk zones related to the consistency of product exports. This forms the basis for state policy aimed at adapting to changing geopolitical and geo-economic conditions. Against the backdrop of increasing sanction pressure, which affects economic growth in Russia and its regions, it is crucial to implement effective strategies to minimize risks. Adaptive state policies focused on localizing these risks will help successfully address emerging threats.

Despite the mechanisms of adaptation within the Russian economy, which have successfully overcome many challenges, they face increasing sanction pressure within new sanction packages. Monitoring and managing risk localization processes caused by sanctions remain priority issues and are a significant part of economic policy in Russia and

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its regions.

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