REGIONAL ECONOMICS

Defining Sectoral Priorities of the Region's Structural Transformation by Searching for Promising Economic Specializations

Nikita M. RUMYANTSEV
Vologda Research Center, Russian Academy of Sciences
Vologda, Russian Federation
e-mail: rumyanik.95@gmail.com
ORCID: 0000-0001-5660-8443; ResearcherID: AAC-2818-2019

Ekaterina G. LEONIDOVA
Vologda Research Center, Russian Academy of Sciences
Vologda, Russian Federation
e-mail: eg_leonidova@mail.ru
ORCID: 0000-0002-9206-6810; ResearcherID: I-8400-2016

Elena S. GUBANOVA
Vologda State University
Vologda, Russian Federation
e-mail: gubanova_elena@mail.ru
ORCID: 0000-0002-8498-5630; ResearcherID: S-4888-2019

Abstract. Global crises and foreign trade restrictions imposed on the Russian economy slow down its growth, affecting export-oriented regions to a great extent. Retaliatory economic measures, including those aimed to promote structural transformation of the economy, require its key directions to be defined. We attempt to determine priorities of the structural transformation of the Vologda Oblast economy by searching for promising types of economic activity. For this purpose, we study theoretical foundations of the search for priorities of sectoral development, elaborate and test a methodological approach to the search for promising branches of regional economic specialization, and identify areas of development for potential growth points. Using the materials of the Vologda Oblast, we make a list of activities whose development is promising from the point of view of long-term economic growth and identify potential opportunities for their introduction into the region's economy. Scientific novelty of our work consists in the development and testing of our own tools for finding priorities for the structural transformation of the regional economy based on identifying promising economic specializations. The information base includes works of Russian and foreign researchers in the field of industrial and spatial development, data from state statistics, the Federal Institute of Industrial Property, scientific electronic library eLIBRARY. ru and regional input-output tables for the Vologda Oblast. The findings of the work can be used in the management of the region's sectoral and spatial development and in research on the issues under consideration.

Key words: region, specialization, structural transformation, promising economic activities, value chains.

Introduction

The new coronavirus pandemic and the 2022 geopolitical crisis and the resulting sanctions pressure on the Russian economy have significantly slowed the pace of national economic development. According to the World Bank, Russia's gross domestic product (GDP) is expected to decline by 4.5% in 2022[1].

Due to broad foreign trade restrictions on the part of unfriendly countries, the slowdown of economic dynamics in export-oriented regions will be particularly strong. The Vologda Oblast is among the regions that have felt the impact of the sanctions.

In addition to personal prohibitions against the owner of the key enterprise of the Vologda Oblast, PJSC "Severstal" A. Mordashov, the EU countries restricted the import of Vologda steel, the supplies of which to Europe accounted for about one third of all revenues. The company is looking for alternative sales channels to other consumers, but this may be delayed due to logistical constraints[2]. The second largest manufacturing plant in the Vologda Oblast, Apatit JSC (the main activity is the production of fertilizers) is also under a number of restrictions, but this time by the Russian government, in particular,

---

[1] The World Bank has improved its forecast for Russia's GDP decline in 2022 from 8.9% to 4.5%. Available at: https://www.interfax.ru/business/866281.

[2] Sanctions hit the steel. Available at: https://www.kommersant.ru/doc/5238819

quotas on the export of mineral fertilizers. On the background of rising prices for commodities used for steel and fertilizer manufacturing (in particular, for coal and gas) and the strengthening of the ruble, Vologda exporting enterprises are losing profits, which has a negative impact on their activities in both the short and long term.

All this substantiates the relevance of structural reforms in the economy of the region. The need for structural reorganization of the Russian economy has been repeatedly stated by E. Nabiullina[3], A. Kudrin[4], M. Mishustin[5]. The resources allocated to adapt to the new conditions are enormous: as A. Siluanov states, the Russian government has allocated about 8 trillion rubles to support the economy[6]. The funds are aimed at stimulating domestic consumer demand, compensating for the damage to industries that have fallen under restrictions, developing import substitution, and supporting small and medium-sized businesses. Researchers have already stated before about the necessity to support the structural transformation of the regional economy. Thus, the main directions of structural transformation of the regional economy include the stimulation of production modernization (Lukin, Uskova, 2018), domestic consumer demand (Zemskova, Koloskov, 2017),

and increase in the fixed capital accumulation rate (Ivanter, 2017). Spatial aspects of structural transformation (Kolesnikov, Tolstoguzov, 2016), changes in the labor market and their relationship with economic growth (Edinak, Shirov, 2021), and transformational mechanisms of national economic systems (Shirov, 2018) are considered.

The availability of management tools and financial and resource support raises the question – in what direction should structural transformations be implemented? The Strategy for spatial development of the Russian Federation until 2025 defines the list of promising types of economic activity for every region. As N.N. Mikheeva notes, solving the issues of regional development and distribution of productive forces within the framework of the above strategic planning document will become one of the most important public policy issues, while there are problems of scientific and methodological support for the implementation of this strategy, including the definition of promising economic specializations (Mikheeva, 2018). Researchers from the Institute of Economics and Industrial Engineering, Siberian Branch of the Russian Academy of Sciences note that the justification of promising economic specializations should be based primarily on the competitive advantages of the region, which are not reflected in the current version of the strategy (Kolomak et al., 2018). Other works also contain some criticism of the provisions of this strategy. Thus, the existing list of industries (precisely industries, not specific types of economic activity), firstly, is very numerous, and secondly, it is rather vague (Ivanov, Buchwald, 2019). In this regard, it is important to identify a capacious list of narrow market niches for sectoral diversification of regional economies based on their competitive advantages.

In view of all the above, we formulated the research purpose, which is to determine the priorities of the structural transformation of the Vologda Oblast economy in conditions of external

---

[3] "To revise approaches to regulation in such a way that, without accumulating excessive risks, banks could continue lending, to support the structural transformation of the economy". Nabiullina predicted difficult times for Russians and companies. Available at: https://lenta.ru/news/2022/05/26/hard/

[4] "Russian economy will be rebuilding for a year and a half or two years: during this time GDP will decline, and then it will shift to growth...". Kudrin estimated the period of economic restructuring in Russia at 1.5–2 years. Available at: https://www.vedomosti.ru/economics/news/2022/05/23/923180-kudrin-perestroiki

[5] "...the decisions taken give business the most powerful tools for adapting to new conditions, to the structural transformation of the economy...". The Cabinet of Ministers forms a position on measures under increasing pressure from the collective West. Available at: https://tass.ru/politika/14748983

[6] Siluanov announced the allocation of 8 trillion rubles to support the economy. Available at: https://www.rbc.ru/rbcfreenews/6290c78c9a79473a2a20018f

turbulence on the basis of the search for promising economic activities. This required solving such tasks as considering the theoretical foundations of the search for industry development priorities, forming and approbating of the methodological approach to the search for promising industries of regional economic specialization, and designing the development directions of potential points of growth. The information base of the research was the works of Russian and foreign scholars in the field of industry and spatial development, and the data of state statistics, the Federal Institute of Industrial Property, scientific electronic library "eLIBRARY. ru" and regional input-output tables in the Vologda Oblast.

Review of theoretical and methodological approaches to determining the current and future specialization of the regional economy

In international and Russian practice, there are various indicators and methods of calculation used to determine the current specialization of regions. Among the most popular is the localization coefficient, also known as the Hoover — Balass coefficient, or the Hoover specialization index. Among the related methods for identifying the sectoral diversity and geographical distribution of industries in the regions numerous indices are used — the Gini, the Hachman, the Krugman, the Hallett, the Lilien, the Ellison and Glaeser concentration indices, etc. The main methods for identifying existing regional specializations found in the Russian literature include coefficients of sector development depth, inter-district marketability, per capita production, Herfindahl — Hirschman index, and localization coefficient (Kutsenko, Eferin, 2019).

Determination of promising economic specialization is a more complex procedure, which is difficult to carry out using only mathematical methods. The review of modern studies on this topic highlighted a number of theoretical and methodological approaches, the implementation of which allows us to find types of activities and market niches, contributing to the intensification of economic growth, transformation of technological chains, and formation of a new national economic structure.

One of the first such approaches was the search for complementary industries based on proximity. The point of departure could be the concept of spatial proximity, which originated in the works of von Thünen (Thünen, 1926) as a study of the distance role from the central city in the location of various types of economic activity and developed in the works of M. Porter, the classic of cluster economics (Porter, 2000). Further research led to the identification of other types of proximity (social, institutional, organizational and cognitive). The above types of proximity were organically combined into one approach using a mathematical apparatus, authored by R. Boschma (Boschma, 2005).

Boschma's model easily compares the weights of different factors in the formation of spatial interactions in different areas. For example, one of the works of the Dutch school (Boschma et al., 2014) proved mathematically that for the formation of joint projects of different firms in the industry of computer games the greatest importance is their belonging to the same concern, and specialization in games of the same type, which is more important than the location of firms in one city. In fact, network effects here replace agglomeration effects, and organizational factors replace geographic factors. The very ease of parameterizing forms of proximity is also attractive: thus, in the presented work institutional proximity in each pair of firms was defined as belonging to the same state (therefore, to the same legal field), cognitive — as belonging to the same sub-sector (production of games of the same type), organizational — as belonging to the same holding, social — as presence/absence of joint projects in the past, and finally, spatial proximity was measured by distance between the headquarters of firms in kilometers.

Further evolution of the concepts of proximity and the development of the innovation economy led to the emergence of technological proximity. Technological proximity refers to the relationship between industries based on established production characteristics and allows to quantify which new industries would be better developed based on the existing technological portfolio of the region (Hidalgo et al., 2007). One of the mathematical methods used to identify promising activities within the concept of technological proximity is the index calculation of comparative advantage. This coefficient is the ratio of the export share of products of a certain type in the total exports of a country to the same type of products in the world exports (Hausmann, Hidalgo, 2011; Rastvortseva, Amanalieva, 2020).

Another concept with potential for the "economy of the future" development is the approach to defining "smart" specialization, developed by the Expert Group "Knowledge for Growth" of the Department for Technology and Innovation of the European Commission in 2005[7]. "Smart" specialization as a means of economic development involves the following goals:

— the emergence and development of new activities with innovation potential;

— diversification of regional economies and, consequently, expansion of production opportunities;

— formation of a diversified system consisting of scientific and production networks and clusters[8].

The algorithm for finding a "smart" specialization at the regional level is revealed in successive steps:

— analyzing the region's innovation potential;

— defining the process and managing the transformation of the economy based on smart specialization;

— developing a common vision of the "economy of the future";

— setting priorities of economic development;

— defining an action plan with a consistent set of policies;

— monitoring and assessment[9].

The main difference of the "smart" specialization from the already existing specialization is that it does not select individual industries (types of economic activity, TEA) as certain "points", but defines a set of TEA in relation to regional competences as a "space of choice". We can say that the "smart" specialization of the region is a fuzzy, and blurred core of regional knowledge and skills, around which other branches of the regional economy are grouped. This is the "field" where the process of stimulating regional economic development and synchronization of actions of different players takes place.

However, there is no integrated method that provides a solution to the question of identifying the "smart" specialization of any of the regions. It is always a combination of a data set that is likely to provide a suitable basis for the smart specialization identification process, this is why a broad multiplication of this approach is quite difficult (Kotov, 2020).

When using any method, it is important to position accurately the regional economy in international and interregional value chains and to identify certain key regional assets. The analysis of existing theoretical and methodological approaches to identifying promising types of economic activity allows us to name a number of key provisions on which the methodology of searching for directions of structural transformation should be based.

In order for the restructuring of the economy to lead to the activation of its dynamics, it is necessary to take into account the existing economic specialization of the region, to detect and eliminate

"bottlenecks" of value chains (VC), to act through the formation of highly productive sectors with export orientation, but it is worth to balance the ratio of domestic and foreign markets. Another cornerstone should be the innovative economic activity types in the context of existing industries and potential technological niches.

Individual examples of the implementation of methods of searching for promising specialization with a substantiated mathematical and statistical apparatus we can be found in such works as authorial models of Russian and Belarusian researchers, developed by request of the Ministries of Economic Development of Russia and Belarus respectively, as well as works of the "Russian Cluster Observatory" Center under the leadership of E.S. Kutsenko.

The methodology of A.V. Kotov and co-authors (Kotov et al., 2019) is based on the construction of a regional competence matrix. For this purpose, the authors calculate a number of indicators assessing the efficiency of current industry specialization, innovation potential, and patent and publication security in the context of a wide list of economic activities. The advantages of this methodological approach include a detailed sectoral nomenclature of the study, accessibility and easy interpretation of the used statistical data, and comprehensiveness of the regional competence analysis.

The methodology of Belarusian researchers has some similarities with the previous one (Berchenko, Mishin, 2018). Thus, at the initial stage, a list of industries, which are the current specializations of the territories, is formed by the method of multi-criteria decision analysis using the calculation of concentration coefficients. Then by expert way on a number of criteria (prospects of specialization areas; investment attractiveness; potential for clustering; availability of human resources; level of innovativeness) the rating scores of economic activities types were formed. Among the positive aspects of the methodology we should note the possibility assessment of clustering economic activities types, taking into account their multiplicity, and the analysis of investment and

human resource potential. The main disadvantage, in our opinion, is the need to attract experts for the second stage of the analysis, which, due to its volume, significantly reduces objectivity.

The methodology examined in the works of E.S. Kutsenko and co-authors (Kutsenko, Eferin, 2019) is based on the approaches of the European Cluster Observatory, which, in turn, use the Porter model. This toolkit is applied to determine the industries of specialization and the prospects for their development by distributing points according to four indicators (level of specialization, size, productivity and dynamics). In order to classify an industry to regional specialization, the territory must simultaneously be in the top 80% of regions by size (S) and the presence of a "star" by the level of specialization (location quotient, LQ). In our opinion, the methodology is rather aimed at determining the existing specializations, but the introduction of the restriction, cutting off insignificant specializations, is one of the advantages of the named methodological approach.

Studies on structural transformation, including regional economies, repeatedly indicate the need to develop value chains (Kryukov et al., 2021; Ilyin et al., 2021), in this connection our position is that the multiplicity of development of promising specializations must be taken into account. In addition, current conditions of economic activity in Russia point to the need to develop import-substituting activities[10]. The described provisions, the small number of scientific works on the development of methodological tools to identify promising specializations, and the interest of the government in this scientific direction[11] provide an opportunity to expand this research field, taking into account global trends in economic science and practice, and the already existing author's toolkit.

---

[10] Putin instructed Russian companies to occupy the niches of the foreign companies that have left Russia. Available at: https://www.rbc.ru/politics/21/09/2022/632b10a69a7947a aaff35edb

[11] Spatial Development Strategy of the Russian Federation for the period up to 2025 (approved by RF Government Resolution 207-r, dated February 13, 2019).

Research methods

The theoretical foundations analysis, the study of the available information base on a wide list of types of economic activity (TEA), the development of regional inter-branch balances and conditions of economic activity changed under the influence of the geopolitical crisis, allowed to form our own approach to the definition of promising types of economic activity.

Based on the approach of A.V. Kotov and co-authors, as a part of the significant components of the assessment in the framework of the proposed methodological approach we analyzed the following aspects:

— effectiveness of industry specialization;
— market potential;
— innovation activity;
— availability of patents and publications relevant to the TEA.

The choice of these components in the methodology of A.V. Kotov et al. is due, on the one hand, to their direct connection with the processes of modern scientific and technological development of Russia, on the other hand, with the possibilities of information support for analysis and evaluation of promising specialization based on the system of representative indicators. In addition, our approach considers the needs for technological sovereignty of the economy and the need to transform the existing VC. For this purpose, indicators of value chain fragmentation[12] and the assessment of the region's import substitution capabilities are used. The novelty of the approach also lies in the use of regional input-output tables as one of the data sources.

The list of indicators for assessing the prospects of TEA is presented in *Table 1*.

Table 1. Indicators used in calculations in determining
the prospective economic specialization of the region

Indicator	Calculation
Effectiveness of industry specialization	
Labor productivity of TEA in the region	$C_1 = \left(\frac{V_{it}^{\text{reg}}}{L_{it}^{\text{reg}}} : \frac{\sum_{i=n} V_{it}^{\text{reg}}}{\sum_{i=n} L_{it}^{\text{reg}}}\right) * \left(\frac{GRP_{nt}^{\text{reg}}}{L_{nt}^{\text{reg}}} : \frac{GRP_{t}^{\text{reg}}}{L_{nt}^{\text{reg}}}\right)$
Labor productivity of TEA in the macroregion	$C_2 = \left(\frac{V_{it}^{\text{reg}}}{L_{it}^{\text{reg}}} : \frac{V_{it}^{\text{mreg}}}{L_{it}^{\text{mreg}}}\right)$
Labor productivity of TEA in the country	$C_3 = \left(\frac{V_{it}^{\text{reg}}}{L_{it}^{\text{reg}}} : \frac{V_{it}^{\text{RF}}}{L_{it}^{\text{RF}}}\right)$
Effectiveness of labor productivity in the industry as a whole in the country	$C_4 = C_1 * \left(\frac{GRP_{t}^{\text{reg}}}{L_{t}^{\text{reg}}} : \frac{GRP_{t}^{\text{RF}}}{L_{t}^{\text{RF}}}\right)$

---

[12] To analyze the functioning of VCs, two indicators are used that characterize the degree of fragmentation of production and allow for a comprehensive assessment of the level of interaction of enterprises in the supply chains and sales of products. The first of them — the length of the production chain (D) — reflects the weighted average number of production stages consistently involved in the production of a particular product or service. The higher the value of D, the greater the share of intermediate products in the resources consumed, the more complex the intermediate links in the supply of resources with technologically related industries. The minimum value of D is assumed when production does not require any intermediate goods, which may indicate a low level of development of production cooperation in the supply chain. The second indicator — the length of the sales chain (U) — records the weighted average number of production stages that products go through after their production before reaching the end consumer. The higher the value of U, the greater the share of intermediate products in gross output, the more complex the intermediate links with technologically related industries in the sale of products. The indicator U takes the value 1 when all manufactured products are directed to final consumption. This situation characterizes the low level of development of production cooperation in the sales chain (Fally, 2012).

End of Table 1

Indicator	Calculation
Market potential	
The importance of TEA in the country	$C_5 = \dfrac{V_{it}^{\mathrm{reg}}}{V_{it}^{\mathrm{RF}}} * 100\%$
Significance of TEA in the region	$C_6 = \dfrac{V_{it}^{\mathrm{reg}}}{GRP_t^{\mathrm{reg}}} * 100\%$
Growth rate of TEA in the region	$C_7 = \sqrt[3]{\dfrac{V_{i(t-2)}^{\mathrm{reg}}}{V_{i(t-3)}^{\mathrm{reg}}} * \dfrac{V_{i(t-1)}^{\mathrm{reg}}}{V_{i(t-2)}^{\mathrm{reg}}} * \dfrac{V_{it}^{\mathrm{reg}}}{V_{i(t-1)}^{\mathrm{reg}}}} * 100\%$
Multiplicity of industry development	$C_8 = D_i \quad C_9 = U_i$
The region's need for import substitution of TEA products	$C_{10} = \dfrac{I_{it}^{\mathrm{reg}}}{V_{it}^{\mathrm{reg}}} * 100\%$
Innovation activity	
Share of the region's R&D expenditures in the volume of the country's TEA	$C_{11} = (\dfrac{R_{i(t-2)}^{\mathrm{reg}}}{R_{i(t-2)}^{\mathrm{RF}}} : \dfrac{R_{t-2}^{\mathrm{reg}}}{R_{t-2}^{\mathrm{RF}}} + \dfrac{R_{i(t-1)}^{\mathrm{reg}}}{R_{i(t-1)}^{\mathrm{RF}}} : \dfrac{R_{t-1}^{\mathrm{reg}}}{R_{t-1}^{\mathrm{RF}}} + \dfrac{R_{it}^{\mathrm{reg}}}{R_{it}^{\mathrm{RF}}} : \dfrac{R_t^{\mathrm{reg}}}{R_t^{\mathrm{RF}}})/3$
Share of shipped goods, works performed, and services provided by the innovative nature of the region's TEA in the volume of the country's TEA	$C_{12} = (\dfrac{N_{i(t-2)}^{\mathrm{reg}}}{N_{i(t-2)}^{\mathrm{RF}}} + \dfrac{N_{i(t-1)}^{\mathrm{reg}}}{N_{i(t-1)}^{\mathrm{RF}}} + \dfrac{N_{it}^{\mathrm{reg}}}{N_{it}^{\mathrm{RF}}})/3$
The share of expenditures on technological innovation (TI) in the region's TEA in the volume of the country's TEA	$C_{13} = (\dfrac{CTI_{i(t-2)}^{\mathrm{reg}}}{CTI_{i(t-2)}^{\mathrm{RF}}} + \dfrac{CTI_{i(t-1)}^{\mathrm{reg}}}{CTI_{i(t-1)}^{\mathrm{RF}}} + \dfrac{CTI_{it}^{\mathrm{reg}}}{CTI_{it}^{\mathrm{RF}}})/3$
Ratio of the proportion of innovative goods, works performed and services provided in the region and in the country	$C_{14} = (\dfrac{\varepsilon_{i(t-2)}^{\mathrm{reg}}}{\varepsilon_{i(t-2)}^{\mathrm{RF}}} + \dfrac{\varepsilon_{i(t-1)}^{\mathrm{reg}}}{\varepsilon_{i(t-1)}^{\mathrm{RF}}} + \dfrac{\varepsilon_{it}^{\mathrm{reg}}}{\varepsilon_{it}^{\mathrm{RF}}})/3$
Share of R&D financing at the expense of the business sector in the total amount of financial resources	$C_{15} = \dfrac{S_{i(t-2)}^{\mathrm{reg}} + S_{i(t-1)}^{\mathrm{reg}} + S_{it}^{\mathrm{reg}}}{3}$
Patent and publication security	
Patent activity	$C_{16} = \dfrac{Pat_i}{\sum_{k=1}^{6} Pat_i}$
Publication activity	$C_{17} = \dfrac{Pub_i}{\sum_{k=1}^{6} Pub_i}$

Legend:
V_{it}^{reg} – the volume of own-produced goods shipped, works performed and services provided by own forces for the i-th TEA in the region for t year; L_{it}^{reg} – the average number of people employed in the i-th TEA in the region in t year; GRP_{nt}^{reg} – the gross value added in the aggregate industry n in year t; V_{it}^{mreg} – the volume of shipped goods of own production, work and services performed by own forces on the i-th TEA in the macroregion for the year t; L_{it}^{mreg} – the average number of people employed in the i-th TEA in the macroregion in year t; V_{it}^{RF} – the volume of own-produced goods shipped, works performed and services provided by own forces for the i-th TEA in the Russian Federation for t year; L_{it}^{RF} – the average number of people employed in the i-th TEA in the Russian Federation in t year; L_t^{reg} – the average number of people employed in the region in year t; GRP_t^{RF} – total gross regional product of the regions of the Russian Federation in t year; L_t^{RF} – the average number of people employed in the Russian Federation in t year; V_{it}^{RF} – the volume of own-produced goods shipped, works performed and services provided by own forces for the i-th TEA in the country for t year; GRP_t^{reg} – regional gross domestic product; D_i – production chain length; U_i – the length of the sales chain (for details see: Lukin, 2022); I_{it}^{reg} – volume of imports of goods, works, services for the i-th TEA; R_{it}^{reg} – amount of domestic R&D expenditures on the i-th TEA of the region in t year; R_{it}^{RF} – amount of domestic R&D expenditures on the i-th TEA of the country in year t; N_{it}^{reg} – the volume of own-produced goods shipped, performed work and services of innovative nature in the i-th TEA of the region in the year t; N_{it}^{RF} – the volume of own-produced goods shipped, works performed and services of innovative nature in the i-th TEA of the country in the year t; CTI_{it}^{reg} – the share of TI costs in the total volume of goods, works, services for the i-th TEA of the region in the year t; CTI_{it}^{RF} – the share of TI costs in the total volume of goods, works, services for the i-th TEA of the country in year t; $\varepsilon_{it}^{\mathrm{reg}}$ – share of innovative goods, works, services in the i-th TEA of the region in the year t; $\varepsilon_{it}^{\mathrm{RF}}$ – the share of innovative goods in the total volume of goods, works, services in the i-th TEA of the country in the year t; S_{it}^{reg} – share of R&D funding from the entrepreneurial sector in year t; Pat_k – number of patents for the i-th TEA of the country; Pub_k – number of publications on the i-th TEA of the country.

Source: own compilation.

After calculating the relevant indicators, they are assigned a point score according to the intervals presented in *Table 2*. The scores are determined on the basis of expert opinion.

The resulting indicator for the selection of promising economic activities of the region is an integral score, based on the points assigned to all the indicators used to evaluate the above four areas:

$$PC_i^{reg} = \left(ESS_i^{reg} + MP_i^{reg} + IA_i^{reg}\right) + PPS_i^{reg},$$

где PC_i^{reg} – value of the integral assessment of the potential of the promising specialization (PC) of the i-th TEA in the region;

ESS_i^{reg} – value of the point assessment of the potential for promising specialization of the i-th TEA according to the criteria block "Effectiveness of sectoral specialization" (ESS);

MP_i^{reg} – the value of the point assessment of the potential of promising specialization of the i-th TEA according to the block of criteria "Market potential" (MP);

IA_i^{reg} – value of the point assessment of the potential of the promising specialization of the i-th TEA on the block of criteria "Innovative activity" (IA);

PPS_i^{reg} – value of the point assessment of the potential for promising specialization of the i-th TEA according to the block of criteria "Patent and publication security" (PPS).

The methodological approach was approbated on the materials of the Vologda Oblast by 235 types of economic activity. The main sources of information are Rosstat data (EMISS (Unified Interagency Information and Statistical System), statistical data showcase, statistics of regional bodies), Rospatent, website eLIBRARY. ru, and our input-output tables for the Vologda Oblast.

Table 2. Scoring of indicators for identifying promising specializations

Criteria	Procedure for assigning points	Criteria	Procedure for assigning points
C1	C1≥1,2 – 1 point 1.2>C1≥0.8 – 0.5 points C1<0.8 – 0 points	C9	C9≥2.5 – 2 points 2.5>C9≥2 – 1 point 2>C9≥1.5 – 0.5 points C9<1.5 – 0 points
C2	C2≥1,2 – 1 point 1.2>C2≥0.8 – 0.5 points C2<0.8 – 0 points	C10	C10<0.5 – 2 points 0.5<C10<1 – 1 point C10≥1 – 0 points
C3	C3≥1,2 – 1 point 1.2>C3≥0.8 – 0.5 points C3<0.8 – 0 points	C11	C11≥5 – 1 point C11<5 – 0 points
C4	C4≥2 – 2 points 2>C≥1.2 – 1 point 1.2≤C4≥0.8 – 0.5 points C4<0.8 – 0 points	C12	C12≥1 – 1 point C12<1 – 0 points
C5	C5≥5 – 1 point 5>C5≥1 – 0.5 points C5<1 – 0 points	C13	C13≥2 – 2 points 2>C13>1 - 1 point C13<1 – 0 points
C6	C6≥10 – 1 point 10>C6≥5 – 0.5 points C6<5 – 0 points	C14	C14≥1 – 1 point C14<1 – 0 points
C7	C7≥120 – 1 point 120>C7≥110 – 0.5 points C7<110 – 0 points	C15	C15≥1 – 1 point C15<1 – 0 points
C8	C8≥2.5 – 2 points 2.5>C8≥2 – 1 point 2>C8≥1.5 – 0.5 points C8<1.5 – 0 points	C16	C16≥0.1 – C16*10 points C16<0.1 – 0 points
		C17	C17≥0.1 – C17*10 points C17<0.1 – 0 points
Source: own compilation according to Kotov et al., 2019, and expert estimates.			

Research results

According to the Atlas of Economic Specialization of Russian Regions (Atlas..., 2021), the Vologda Oblast specializes in metals and metal processing industry, agricultural services and fertilizer production, forest industry and manufacture of wood products. These conclusions are confirmed and supplemented by other researchers. Thus, food industry, mechanical engineering, and tourism should be added to the already named TEA (Leonidova, Sidorov, 2019; Rumyantsev, Leonidova, 2020). The results of calculations of point assessments according to the described methodology on the materials of the Vologda Oblast for 2020 are presented in *Table 3*.

Table 3. Point assessments of promising economic specializations of the Vologda Oblast

Industry	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	Total
Production of basic chemicals, fertilizers and nitrogen compounds, plastics and synthetic rubber in primary forms	1	1	1	2	1	1	2	2	2	0	0	0	0	0	0	2.1	2.8	17.9
Production of machinery and equipment for agriculture and forestry	1	1	1	2	0.5	0	2	2	1	2	0	0	0	0	1	3	1.3	17.8
Production of other food products	1	1	1	2	0	0	2	2	0	0	0	0	0	0	1	2.2	2.6	14.8
Production of other steel products by primary processing	1	0.5	1	1	1	0	2	2	2	0	0	0	0	0	1	0.6	1.9	14
Production of cellulose, wood pulp, paper and cardboard	1	0.5	1	1	0.5	0	2	2	2	0	0	0	0	1	1	1.0	0.9	13.9
Production of abrasive and non-metallic mineral products	1	1	1	1	0.5	0	2	2	2	0	0	0	0	0	1	0	0	11.5
Installation of industrial machinery and equipment	1	1	1	2	0.5	0	2	1	2	0	0	0	0	0	1	0	0	11.5
Production of basic precious metals and other non-ferrous metals	1	0	0	2	0	0	2	2	2	1	0	0	0	0	1	0	0	11
Sawing and planing of wood	0	0.5	1	0	1	0	2	2	2	0	0	0	0	1	1	0	0	10.5
Production of concrete, cement and gypsum products	0	0	0.5	0	0	0	2	2	2	0	0	0	2	1	1	0	0	10.5
Source: own compilation.																		

According to the results of testing our methodology, the following types of economic activity were recognized as potential base points for the formation of a promising specialization of the region (*Fig. 1*):

— sawing and planing wood;

— production of products from concrete, cement and gypsum;

— production of abrasive and non-metallic mineral products, not included in other groups;

— installation of industrial machinery and equipment;

— production of basic precious metals and other non-ferrous metals, production of nuclear fuel;

— production of other steel products by primary processing;

— production of cellulose, wood pulp, paper and cardboard;

— production of other food products;

— production of basic chemicals, fertilizers and nitrogen compounds, plastics and synthetic rubber in primary forms;

— production of machinery and equipment for agriculture and forestry.

The formation of the promising specialization profile of the Vologda Oblast allows to combine types of economic activities to achieve a synergistic effect of their interaction and to search for potential market niches of production.

The existing sectoral specialization of the Vologda Oblast in agriculture, production of timber products and tourism allows to combine the following types of economic activity into conditional chains (*Fig. 2–4*).
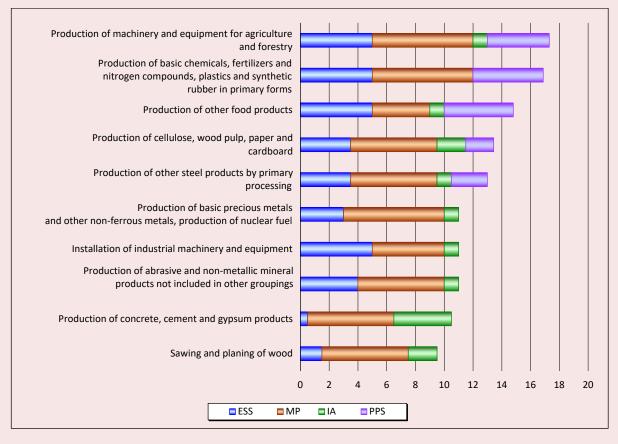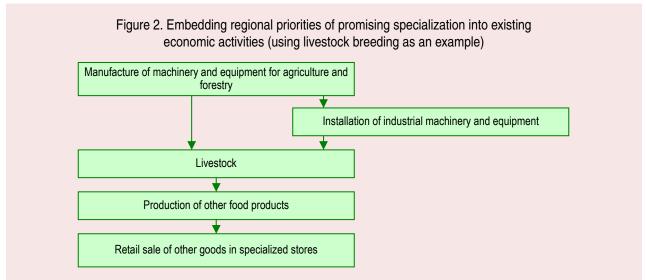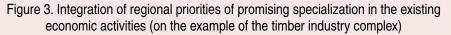

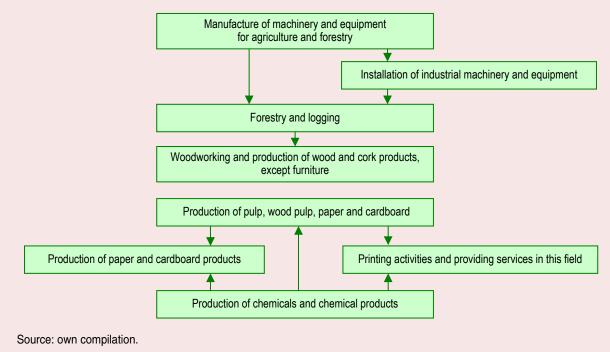Figure 1. Results of integral assessments of the Vologda Oblast TEA potential

Source: own compilation.

The existing types of industry specialization need to update the material and technical base due to its significant wear. In the context of the termination of import supplies of mechanical engineering products, the development of own production of machinery and equipment for agriculture, among other things, solves the problems of technological sovereignty of the regional economy.

The analysis of patent activity allows us to note the opportunities for expanding the range of other food products produced. For example, specialists of the Vologda State Dairy Academy named after N.V. Vereshchagin have developed technologies for the production of various types of sports nutrition from the products of livestock breeding. Both in the Vologda Oblast and in the Northwestern Federal

Figure 2. Embedding regional priorities of promising specialization into existing economic activities (using livestock breeding as an example)

Manufacture of machinery and equipment for agriculture and forestry

Installation of industrial machinery and equipment

Livestock

Production of other food products

Retail sale of other goods in specialized stores

Source: own compilation.

Figure 3. Integration of regional priorities of promising specialization in the existing economic activities (on the example of the timber industry complex)

Manufacture of machinery and equipment for agriculture and forestry

Installation of industrial machinery and equipment

Forestry and logging

Woodworking and production of wood and cork products, except furniture

Production of pulp, wood pulp, paper and cardboard

Production of paper and cardboard products

Printing activities and providing services in this field

Production of chemicals and chemical products
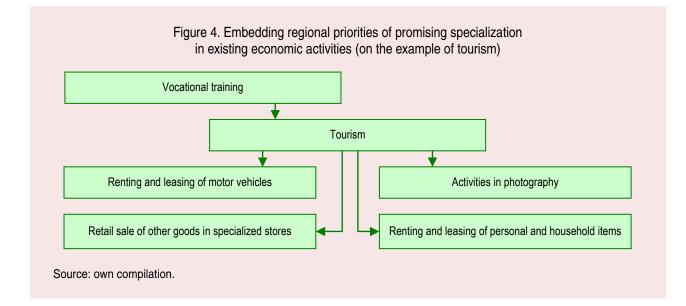
Source: own compilation.

District as a whole, the production of such products is not established, but there is demand for it in Russia and in the region.

In the timber industry there is a similar situation with the state of the material and technical base. The production of products closer to the end consumer is limited by the lack of imported components. For example, the dairy industry in the Vologda Oblast faced a shortage of packaging for its own products (the production of dairy products decreased by 18.9%, the main reason being the lack of packaging for pasteurized milk) (Sidorov, 2022). In the printing industry there is a significant demand for basic raw materials (paper), as well as a shortage of dye pigments – the fifth package of sanctions adopted by the European Union in the beginning of April in addition to some types of equipment and coal prohibits the import into Russia of barrier foils, dyes, pigments, varnishes, paints, chemicals and products used in paper and cardboard processing, equipment for offset, gravure printing[13]. We see the possibility of repositioning the region in the chains

of creating these types of products with the inclusion of the missing fragments, taking into account the already developed types of economic activity.

The economy of the Vologda Oblast is based not only on the sectors of material production. Thus, tourism stands out among the industries due to the high labor productivity of this type of economic activity in the region and a significant multiplier effect. The tourism industry requires the training of specialists in various profiles, and the development of related economic activities.

The government authorities also see the prospect in the development of tourism, which is reflected in the active financial and organizational support of this TEA within the framework of the national project "Tourism and the hospitality industry", in stimulating domestic tourist demand from the population. Also an argument in favor of stimulating the development of tourism as a promising economic specialization of the region is the fact that the tourism industry is an active participant in the innovation process. For example, the government

Figure 4. Embedding regional priorities of promising specialization in existing economic activities (on the example of tourism)

Source: own compilation.

---

[13] "Manufacturers of almost all products will face a shortage of paints and cardboard in both consumer and storage packaging. So far we cannot talk about a fundamental change in the assortment or volume of products due to the fact that companies have enough leftovers until mid-summer 2022". No bright colors: the food industry is facing a shortage of packaging and paint. Available at: https://www.dp.ru/a/2022/06/01/Bez_jarkih_cvetov

widely encourages the construction of fast-build eco-hotels and the development of inclusive tourism based on information technology (Leonidova, 2021).

Conclusion

Determination of the future trajectory of the transformation of the regional economy's sectoral structure on the basis of the proposed methodology of identifying promising TEA demonstrated the need to adjust the strategic guidelines of the Vologda Oblast economy's development. The outlined priorities in the Spatial development strategy can be used as the basic industries for diversifying the economy and deepening of product recycling. However, the construction of a highly productive, competitive and innovative economy is possible only with the transition to private TEA, filling market niches in order to ensure active economic dynamics and technological sovereignty. On the data of the Vologda Oblast the list of TEA, the development of which is promising from the point of view of long-term economic growth, was formulated, and the potential opportunities for their introduction in the existing structure of the national economy of the region were determined.

The priorities of sectoral development defined by us are not a permanent benchmark: as the national economy and scientific and technological progress evolve, it is necessary to benchmark promising regional specialization in order to adapt the economy to changing conditions.

Another important aspect of further research and its implementation in management practice is to take into account the interests and competencies of neighboring entities. Knowledge spillovers are necessary, and the diversification of the country's economy on the basis of harmonization of territorial specializations.

The scientific novelty of the conducted research consists in the development and approbation of our tools intended to find the priorities of the regional economy structural transformation, based on the identification of promising economic specializations. The practical significance lies in the possibility of using the results obtained by the authorities in the practice of managing the sectoral and spatial territorial development.

Further research will be devoted to the development and improvement of mechanisms for the development of promising economic specialization at the regional and federal levels, and the improvement of our methodology for determining promising regional specializations for the formation of sectoral priorities of structural policy.

References

Berchenko N.G., Mishin A.V. (2018). Practical aspects of definition of regional economic complexes perspective specialization. *Ekonomika, modelirovanie, prognozirovanie=Economics, Modeling, Forecasting*, 12, 19−30 (in Russian).

Boschma R., Balland P.-A., de Vaan M. (2014). The formation of economic networks: A proximity approach. *Regional Development and Proximity Relations*, 7, 243−266.

Boschma R.A. (2005). Proximity and innovation: A critical assessment. *Reg. Stud.*, 39, 61−74.

Edinak E.A., Shirov A.A. (2021). Assessment of the relationship between the qualification structure of employment and household consumption using the input-output tables. *Studies on Russian Economic Development*, 32(6), 593−602. DOI:10.1134/S1075700721060046

Fally T. (2012). *Production Staging: Measurement and Facts.* Boulder: University of Colorado-Boulder.

Gokhberg L.M., Kutsenko E.V. (Eds.). (2021). *Atlas ekonomicheskoi spetsializatsii regionov Rossii* [Atlas of Economic Specialisation of Russian Regions]. National Research University Higher School of Economics. Moscow: HSE.

Hausmann R., Hidalgo C.A. (2011). The network structure of economic output. *Journal of Economic Growth*. 16(4), 309−342.

Hidalgo C.A. et al. (2007). The product space conditions the development of nations. *Science*, 317(5837), 482−487.

Ilyin V.A., Uskova T.V., Lukin E.V. et al. (2021). *Transformatsiya mezhregional'nykh tsepochek sozdaniya stoimosti: problemy i perspektivy* [Transformation of Interregional Value Chains: Problems and Prospects]. Vologda: FSBIS VolRC RAS.

Ivanov O.B., Bukhval'd E.M. (2019). "Perspective economic specialization" as the innovation of the regional development policy. *ETAP: ekonomicheskaya teoriya, analiz, praktika=ETAP: Economic Theory, Analysis, and Practice*, 6, 49−65. DOI: 10.24411/2071-6435-2019-10122 (in Russian).

Ivanter V.V. (2017). Prospects for economic growth recovery in Russia. *Vestnik RAN=Herald of the Russian Academy of Sciences*, 1, 15−28. DOI: 10.7868/S0869587317010042 (in Russian).

Kolesnikov N.G., Tolstoguzov O.V. (2016). Structural changes in the economy of the Russian Northwest: Spatial dimension. *Baltiiskii region=The Baltic Region*, 8(2), 30−47. DOI: https://doi.org/10.5922/2074-9848-2016-2-2 (in Russian).

Kolomak E.A., Kryukov V.A., Mel'nikova L.V. et al. (2018). Strategy for the spatial development of Russia: Expectations and realities. *Region: Ekonomika i Sotsiologiya=Region: Economics and Sociology*, 2(98), 264−287. DOI 10.15372/REG20180212 (in Russian).

Kotov A.V. (2020). Methodological approach to smart specialization for the Russian regions. *Region: Ekonomika i Sotsiologiya=Region: Economics and Sociology*, 2(106), 22−45. DOI 10.15372/REG20200202 (in Russian).

Kotov A.V., Grishina I.V., Polynev A.O. (2019). *Umnaya spetsializatsiya regiona − variant resheniya dlya Rossii: nauchnyi ocherk* [Smart Specialization of the Region − A Solution Option for Russia: An Academic Essay]. Moscow: Russian Foreign Trade Academy (RFTA) of the Ministry of Economic Development of the Russian Federation.

Kryukov V.A., Suslov N.I., Yagolnitser M.A. (2021). The Eastern vector of Russian economy − success based on the synergy of interaction and interregional cooperation. *Nauchnye trudy Vol'nogo ekonomicheskogo obshchestva Rossii=Scientific Works of the Free Economic Society of Russia*, 230(4), 90−102. DOI 10.38197/2072-2060-2021-230-4-90-102 (in Russian).

Kutsenko E., Eferin Y. (2019). "Whirlpools" and "Safe Harbors" in the dynamics of industrial specialization in Russian regions. *Foresight and STI Governance*, 13(3), 24−40.

Leonidova E.G. (2021). Russian tourism during the COVID-19: Assessing effect of stimulating domestic demand for the country and regions' economy. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz=Economic and Social Changes: Facts, Trends, Forecast*, 14(2), 59−74. DOI: 10.15838/esc.2021.2.74.4 (in Russian).

Leonidova E.G., Sidorov M.A. (2019). Structural changes in the economy: Searching for sectoral drivers of growth. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz=Economic and Social Changes: Facts, Trends, Forecast*, 12(6), 166−181. DOI: 10.15838/esc.2019.6.66.9 (in Russian).

Lukin E.V. (2022). Regulation of interregional value chains: Problems of analysis and modeling. *Problemy prognozirovaniya=Studies on Russian Economic Development*, 1(190), 19−33. DOI 10.47711/0868-6351-190-19-33 (in Russian).

Lukin E.V., Uskova T.V (2018). Structural transformation issues in regional economy. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz=Economic and Social Changes: Facts, Trends, Forecast*, 11(6), 26−40. DOI: 10.15838/ esc.2018.6.60.2. (in Russian).

Mikheeva N.N. (2018). Strategy of spatial development: New stage or repetition of old mistakes? *EKO=ECO*, 5(527), 158−178 (in Russian).

Porter M. (2000). Locations, clusters, and company strategy (chapter 13). In: *The Oxford Handbook of Economic Geography*. Oxford University Press.

Rastvortseva S.N., Amanalieva A.B. (2020). Applying the technological proximity method for the analysis of national innovation systems. *Zhurnal ekonomicheskoy teorii=Economic Theory Journal*, 17(4), 781−788. DOI 10.31063/2073-6517/2020.17-4.3 (in Russian).

Rumyantsev N.M., Leonidova E.G. (2020). Asymmetry problems of structural shifts in regional economy. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz=Economic and Social Changes: Facts, Trends, Forecast*, 13(6), 169−183. DOI: 10.15838/esc.2020.6.72.10 (in Russian).

Shirov A.A. (2018). *Transformatsiya struktury ekonomiki: mekhanizmy i upravlenie: monografiya* [Transformation of the Structure of the Economy: Mechanisms and Management: A Monograph]. Moscow: MAKS Press.

Sidorov M.A. (2022). Monitoring of the economy: May 2022. *Problemy razvitiya territorii=Problems of Territory's Development*, 26(3), 88−98. DOI: 10.15838/ptd.2022.3.119.7 (in Russian).

Von Thünen J.H. (1926). *Izolirovannoe gosudarstvo* [Der isolierte Staat in Beziehung auf Landwirtschaft und Nationalökonomie, oder Untersuchungen über den Einfluß, den die Getreidepreise, der Reichthum des Bodens und die Abgaben auf den Ackerbau ausüben]. Moscow: Ekonomicheskaya zhizn'.

Zemskova E.S., Koloskov D.A. (2017). Deformation of the structure of final consumption as an obstacle to economic growth (on the example of the republic of Mordovia). *Naukovedenie*, 6. Available at: https://naukovedenie.ru/PDF/77EVN617.pdf (in Russian).

Information about the Authors

Nikita M. Rumyantsev – Junior Researcher, Vologda Research Center, Russian Academy of Sciences (56A, Gorky Street, Vologda, 160014, Russian Federation; e-mail: rumyanik.95@gmail.com)

Ekaterina G. Leonidova – PhD in Economics, Senior Researcher, Vologda Research Center, Russian Academy of Sciences (56A, Gorky Street, Vologda, 160014, Russian Federation; e-mail: eg_leonidova@mail.ru)

Elena S. Gubanova – Doctor of Sciences (Economics), Professor, Vologda State University (15, Lenin Street, Vologda, 160000, Russian Federation; e-mail: gubanova_elena@mail.ru)