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Classification of Priority Product Markets for the Strategic Implementation of Competition Policy

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Abstract

The need of differentiating state competition policy in Russia is consistent with the National Competition Development Plan and the Standard for the Development of Competition in the Constituent Entities of the Russian Federation. The purpose of this study is to classify priority product markets and regions to ensure effective monitoring and implementation of competition policy. Based on Rosstat data for the period 2019–2023, four clusters of regions were identified: diversified, industrial, agricultural, and developing. The findings are supported by expert analysis and include quantitative economic characteristics of each cluster. The practical significance of the study lies in the potential use of its results by public authorities for more targeted monitoring of market conditions and support of competitive environments in product markets. The proposed classification enhances the effectiveness of competition policy implementation and contributes to the development of competition in regional product markets. The scientific novelty of the article lies in a comprehensive approach to the classification of product markets and regions based on up-to-date socio-economic data, as well as in development of policy-oriented tools.

Keywords: competition, regional economy, National Competition Development Plan, Standard for the Development of Competition in the Constituent Entities of the Russian Federation

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落实竞争政策战略目标的优先商品市场的分类

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摘要
俄罗斯在国家竞争政策领域实行差异化管理的必要性，符合"国家竞争发展规划"及"俄罗斯联邦各主体竞争发展标准"。本研究旨在对优先商品市场与地区进行分类，以实现对竞争政策执行情况的有效监测与落实。基于俄罗斯联邦统计局2019 – 2023年数据，本研究将各地区划分为四个集群：多元化型、工业主导型、农业主导型和发展中。研究成果通过专家论证获得确认，并涵盖对各集群经济量化特征的系统性分析。本文章的实践价值在于，相关政府部门可运用研究成果，对商品市场竞争环境的状况进行更具针对性的监测，并为维护市场竞争提供精准支持。这一分类方法有助于提升竞争政策的实施效能，并推动各地区商品市场竞争环境的发展。本文章的科学新奇在于，采用综合研究方法对商品市场和区域进行分类，运用最新的社会经济数据，并为国家政策制定提供配套的建议性工具。
关键词： 竞争、区域经济、国家竞争发展规划、俄罗斯联邦组成实体的竞争发展标准。

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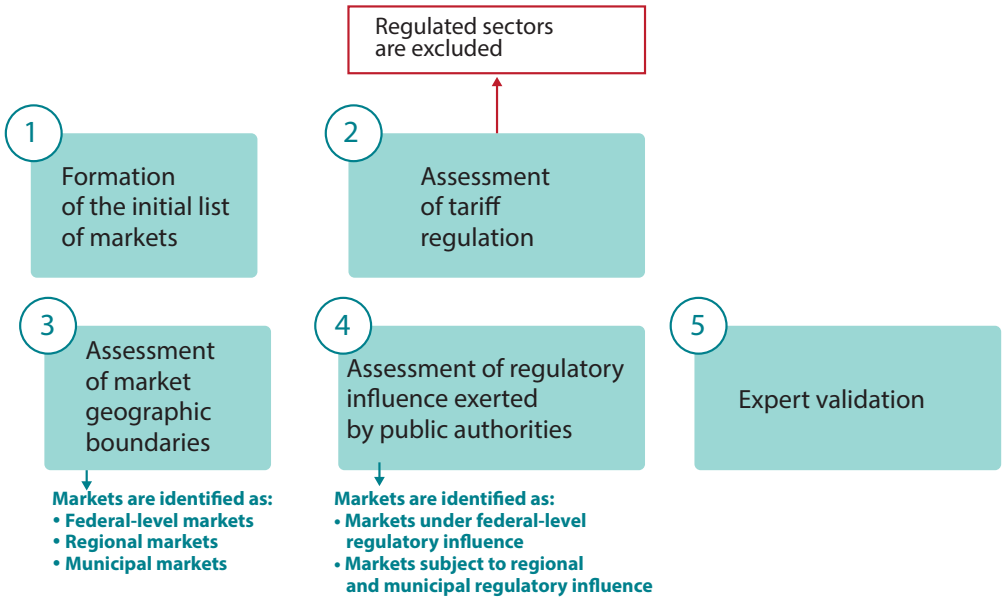
Introduction

Economic theory widely recognizes competition as one of the key determinants of economic efficiency under market conditions. Competition performs a number of essential functions required for the sustainable economic development of a region, industry, or market. These functions include limiting the market power of individual firms; coordinating supply with consumer demand in the long run; improving the efficiency of factor allocation and providing incentives for cost reduction; promoting price formation conducive to social welfare; and stimulating innovation [Chainikov, Kulikov, 2017]. At the same time, competition as a market environment does not necessarily emerge spontaneously, even within relatively free market systems. Moreover, the presence of competition may pose challenges for individual producers, requiring continuous adaptation to a dynamic environment and increasing uncertainty and risk in profitability calculations and future cash flow projections. Both academic research and practical experience indicate that market structures in which a firm acquires monopoly status may remain stable over time [Allingham, 1976], while nevertheless being socially suboptimal. In such cases, the monopolistic firm, acting in its own economic interest, may pursue strategies aimed at reinforcing its dominant position and erecting barriers to market entry for potential competitors. Consequently, purposeful intervention by antitrust and regulatory authorities is required to establish and maintain a competitive environment in markets of public importance.

The set of measures aimed at promoting competition and, as a result, increasing social welfare and overall economic efficiency is commonly referred to as competition policy. Studies in this field emphasize that competition policy represents a key instrument for implementing the main directions of socio-economic development at the regional level including the formation of an institutional environment conducive to innovation, inflation control, improvement of living standards, and enhancement of the overall competitiveness of regional economies [Bobrova et al., 2017].

Historically, competition policy in Russia began to take shape significantly later than in many other countries, which was largely due the relatively recent transition from a centrally planned to a market-based economic system. In Soviet economic literature, competition was predominantly viewed in negative terms as an economic phenomenon. It was defined as an antagonistic form of economic rivalry among private commodity producers, most characteristic of capitalism [Kharlamov, 2005]. Beginning with the perestroika period, this perception gradually shifted toward the opposite view, accompanied by growing recognition of competition as a crucial mechanism for improving

Fig. 1. Approach to the identification and classification of priority product markets



Source: prepared by the authors.

production efficiency, reducing prices, enhancing social welfare, and acting as a driver of economic development at the local and regional levels, as well as at the national level.

At present, the development of competition and the prevention of monopolistic activity are recognized in Russia as priority areas of activity for federal and regional legislative and executive authorities. On April 17, 2019, the Government of the Russian Federation approved the *Standard for the Development of Competition in the Constituent Entities of the Russian Federation*. This document defines the objectives and principles of state policy aimed at promoting competition at the federal, regional, and municipal levels. Subsequently, by Government Decree dated September 2, 2021, the *National Competition Development Plan (Roadmap) for 2021–2025* was adopted. The Plan explicitly states that addressing competition development objectives constitutes one of the elements necessary for achieving national development goals. One of its primary tasks is identified as the promotion of fair competition in product markets.

This article addresses two interrelated issues that arise in the process of designing governance frameworks aimed at shaping efficient product market structures. The first issue concerns the identification and classification of priority product markets, taking into account national goals and the strategic objectives of economic development, in line with the provisions of the Standard concerning the approval of product market lists. To enhance the practical relevance of the study, an expert panel was engaged to verify the results of identifying priority product markets.

The second issue relates to the need for a clear differentiation of the objects of competition policy—namely, markets—according to the levels at which competition policy instruments may be applied by public authorities. In particular, an assessment was conducted of market geographic boundaries and the capacity of public authorities to affect the development of competition within those markets. In determining geographic boundaries, the criterion of mandatory physical presence within the territory of service provision or production was applied.

Addressing both issues is intended to contribute to the refinement of methodologies for assessing the level of competition development in the constituent entities of the Russian Federation, as well as to improving the practical implementation of competition policy measures outlined in the Standard and the National Plan.

The following sections describe the method proposed for determining the list of priority product markets and their classification according to market geographic scope (federal, regional, and municipal) and according to the degree of regulatory influence exerted by public authorities (markets under federal-level regulatory influence and markets subject to regional and municipal regulation). A separate section is devoted to clustering the constituent entities of the Russian Federation based on socio-economic indicators in order to ensure interregional comparability of competition levels, using the structure and scale of gross regional product as key criteria. The results of applying the proposed approach to market classification and regional clustering are presented. The article concludes with a discussion of the feasibility of applying these approaches in the practical implementation of competition policy measures defined in the National Competition Development Plan and the Standard.

1. List and Classification of Product Markets

The identification of priority product markets, taking into account national goals and the strategic objectives of economic development of the Russian Federation, is proposed to be carried out through five successive stages (Figure 1).

The stages presented in Figure 1 are determined by the key criteria used for the classification of product markets:

- alignment with national goals and objectives for competition and economic development;
- whether the market is subject to price or tariff regulation;
- geographic boundaries of the market;
- the scope of regulatory authority and policy instruments available to public authorities.

The initial list of markets is formed in accordance with the priority areas of economic development of the Russian Federation. At the next stage, markets are assessed to determine whether they are subject to tariff regulation, which primarily applies to sectors classified as natural monopolies. For such markets, the promotion of competition between firms is not considered appropriate. Subsequently, the geographic boundaries of markets are assessed, together with the capacity of public authorities to shape competitive conditions within the respective markets. When determining geographic boundaries, the criterion of mandatory physical presence within the relevant geographic area of service provision or production is also applied. In addition, to enhance the practical relevance of the research, an expert panel was engaged to verify the results of identifying priority product markets.

The selection of priority product markets was aligned with national goals and the strategic objectives of economic development of the Russian Federation. In addition, an analysis of priority goods included in the Consumer Price Index (CPI) and Producer Price Index (PPI) baskets was conducted in order to form the initial list of markets (Figure 2).

Within the CPI basket, 65 products were examined for the purpose of identifying priority markets, while within the framework of the National Competition Development Plan, 15 sectors of the economy were considered.

Among the selected markets, three are subject to tariff regulation:

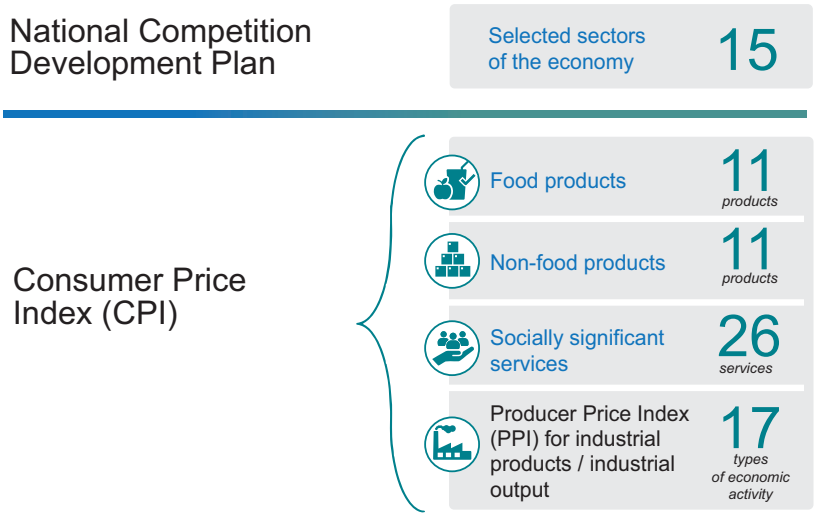
- the market for regional municipal solid waste operators;
- the urban road transport market;
- the gas market.

For these markets, established regulatory frameworks governing the activities of market participants are already in place. As a result, among the 40 non-tariff-regulated markets considered, 12 were classified as federal-level markets, while 28 were classified as regional and municipal markets.

The following product markets were classified as federal industrial markets:

- construction materials;
- thermal (energy) coal;
- crude oil extraction;
- chemical and petrochemical products;
- extraction of ferrous metal ores;
- extraction of non-ferrous metal ores;
- railway transport services;
- timber products.

Fig. 2. Initial set of products and industries used to define priority product markets



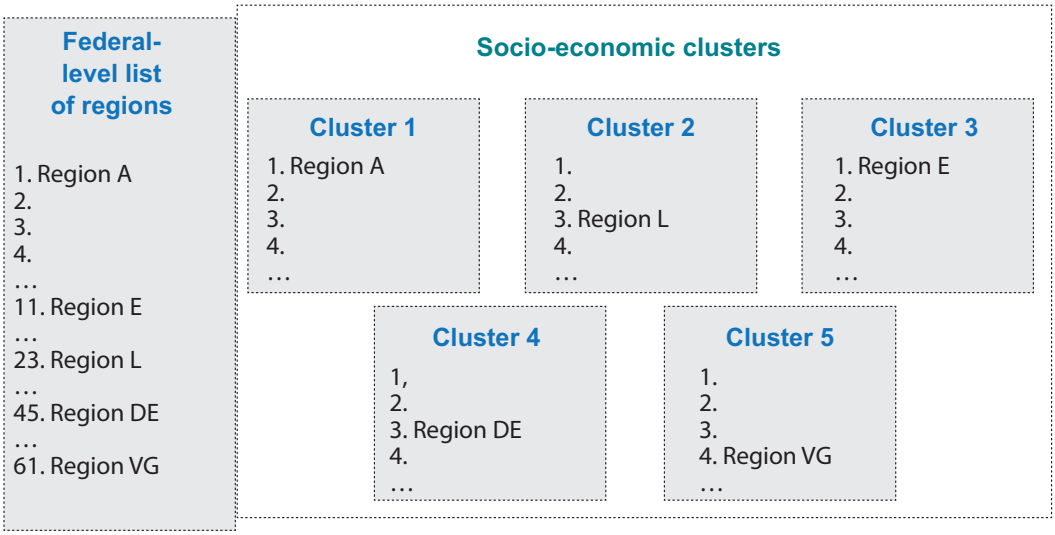
Source: prepared by the authors based on the National Competition Development Plan and official Rosstat statistics.

The following markets were classified as federal-level markets with cross-sectoral characteristics:

- retail financial services;
- higher education (universities);
- software development.

To classify the remaining subnational markets into regional and municipal categories, an expert panel was formed as part of the study. The panel consisted of representatives of regional executive authorities responsible for promoting competition at the regional level. In total, representatives from four constituent entities of the Russian Federation participated in the expert panel (one representative from each region): Leningrad Region, the city of Moscow, Moscow Region, and the Republic of Tatarstan.

Fig. 3. Cluster-based comparison of competition development level across regional product markets



Источник: подготовлено авторами.

The list of subnational markets was distributed to all panel members, who were asked to indicate whether each market should be classified as regional or municipal. As a result of the expert assessment, 20 municipal markets and 8 regional markets were identified.

2. Grouping of Regions into Socio-Economic Clusters

To ensure a comparable analysis of competition development in priority product markets, this study employs a cluster analysis of Russian regions using selected macro- and microeconomic indicators. As of 2024, the Russian Federation comprises 89 constituent entities with equal legal status. These regions exhibit substantial variation in socio-economic indicators that reflect differences in economic development and overall social welfare. From a methodological standpoint, the assessment of competition in a particular regional market is more appropriately conducted by comparing that market with markets in regions sharing similar economic characteristics, rather than with all constituent entities of the Russian Federation simultaneously. Accordingly, the initial stage of the analysis focuses on grouping regions into several socio-economic clusters, within which subsequent comparative assessments of competition levels in the examined product markets can be carried out. Figure 3 provides a schematic representation of the principle underlying this cluster-based comparison.

When selecting indicators for regional clustering, several key assumptions were taken into account.

First, the data must be available in a unified format for all constituent entities on a regular (annual) basis. The most reliable sources of such information are official state statistical observations.

Table 1
Variables used in regional clustering

Variable		Data source
Macroeconomic indicators of regional welfare		
Variable 01	Gross regional product (GRP)	Rosstat
Variable 02	Population size	Rosstat
Sectoral structure of gross value added		
Variable 03	Share of agriculture, forestry, hunting, fishing, and aquaculture in GRP	Rosstat
Variable 04	Share of mining and quarrying in GRP	Rosstat
Variable 05	Share of manufacturing in GRP	Rosstat
Variable 06	Share of wholesale and retail trade; repair of motor vehicles and motorcycles in GRP	Rosstat
Entrepreneurial and investment activity		
Variable 07	Share of small and medium-sized enterprises (SMEs)	Rosstat
Variable 08	Investment in fixed capital growth	Rosstat
Retail market characteristics		
Variable 09	Retail trade turnover per capita	Rosstat
Variable 10	Structure of retail trade turnover	Rosstat
Output and productivity dynamics		
Фактор 11	Labor productivity index	Rosstat

Source: prepared by the authors based on a review of relevant academic literature.

Second, the suitability of the selected variables for clustering purposes must be supported by prior academic research.

Third, the indicators must be quantitative in nature, rather than qualitative or quasi-quantitative, allowing for data normalization and the application of mathematical procedures required for the proper functioning of the clustering algorithm.

Finally, the selected indicators should characterize the conditions influencing competition, rather than represent outcomes resulting from an already established level of competition in product markets. The overall research objective involves comparing competition levels among regions assigned by the algorithm to the same cluster. Accordingly, macro- and microeconomic indicators directly related to price levels for goods and services—such as regional inflation rates, price indices, and similar variables—were deliberately excluded from the analysis. This approach is based on the assumption that regional price levels, among other determinants, depend on the degree of competition in product markets. Consequently, price indicators represent dependent rather than explanatory variables. From a methodological perspective, excluding such variables prevents regions from being grouped according to the very level of competition that is subsequently subject to analysis.

The final list of variables selected for clustering is presented in Table 1. Data for all variables included in the analysis are obtained through official state statistical monitoring.

Macroeconomic indicators of regional welfare

Gross regional product (GRP) is a key indicator of regional economic activity and living standards, reflecting the process of producing goods and services intended for final use. As noted by Trofimova [2015], "in the development and implementation of regional socio-economic development programs, primary emphasis is placed on increasing gross regional product (GRP) as the foundation for improving the population's standard and quality of life." Descriptive statistics for GRP by federal districts are presented in Table 2.

The cited study also emphasizes that this indicator should be considered in relation to the level of per capita monetary income of the region's population, as "a balanced relationship between the rate of economic growth and the growth of population welfare constitutes an important determinant of sustainable socio-economic development of regions" [Trofimova, 2015]. Taking into account the methodological features of cluster analysis, population size and gross regional product (GRP) are therefore used jointly for regional classification. Descriptive statistics for population size by federal districts are presented in Table 3.

Indicators Describing the Sectoral Structure of Gross Value Added

The structure of gross regional product (GRP) by type of economic activity reflects the sectoral specialization of regions. In the academic literature, this indicator is widely used as a key determinant of interregional differences in competitiveness [Akhunov, 2015] and in forecasting regional socio-economic development [Trofimova, 2015]. Four major groups of economic activities were analyzed, following the classification used in the Rosstat statistical database:

- agriculture, forestry, hunting, fishing, and aquaculture;
- mining and quarrying;
- manufacturing;
- wholesale and retail trade; repair of motor vehicles and motorcycles.

Descriptive statistics for the share of agriculture in GRP by federal districts are presented in Table 4.

Descriptive statistics for the share of mining and quarrying in GRP by federal districts are presented in Table 5. This indicator exhibits a high coefficient of variation,

Table 2
Descriptive statistics for gross regional product (GRP) (RUB bln)

Federal district	Mean	Minimum	Maximum	Standard deviation	Coefficient of variation
CFD	1,541	177	16,019	3,750	2.43
NWFD	802	168	4,364	1,205	1.50
SFD	724	70	2,366	812	1.12
NCFD	293	63	739	280	0.96
VFD	833	179	2,201	612	0.73
UFD	1,762	210	3,114	1,072	0.61
SibFD	741	51	1,946	598	0.81
FEFD	435	51	968	341	0.78
Russian Federation (total)	927	51	16,019	1,862	2.01

Note: CFD — Central Federal District; NWFD — Northwestern Federal District; SFD — Southern Federal District; NCFD — North Caucasian Federal District; VFD — Volga Federal District; UFD — Ural Federal District; SibFD — Siberian Federal District; FEFD — Far Eastern Federal District
Source: prepared by the authors based on Rosstat data.

Table 3
Descriptive statistics for population size in the constituent entities of the Russian Federation (mln)

Federal district	Mean	Minimum	Maximum	Standard deviation	Coefficient of variation
CFD	2.19	0.64	12.65	3.04	1.39
NWFD	1.27	0.04	5.39	1.44	1.13
SFD	2.06	0.27	5.66	1.97	0.96
NCFD	1.41	0.47	3.10	1.10	0.78
VFD	2.10	0.68	4.04	1.13	0.54
UFD	2.06	0.54	4.31	1.50	0.73
SibFD	1.71	0.22	2.87	1.07	0.62
FEFD	0.74	0.05	1.90	0.58	0.77
Russian Federation (total)	1.73	0.04	12.65	1.81	1.05

Source: prepared by the authors based on Rosstat data.

Table 4
Descriptive statistics for the share of agriculture in GRP (%)

Federal district	Mean	Minimum	Maximum	Standard deviation	Coefficient of variation
CFD	9.52	0.10	25.90	7.26	0.76
NWFD	5.37	0.10	12.30	4.05	0.75
SFD	10.13	2.90	22.50	5.99	0.59
NCFD	14.07	10.20	18.10	3.29	0.23
VFD	7.96	1.60	18.10	4.91	0.62
UFD	3.60	0.10	10.60	3.90	1.08
SibFD	5.50	2.20	12.70	3.60	0.65
FEFD	6.41	1.40	27.40	7.13	1.11
Russian Federation (total)	7.87	0.10	27.40	5.98	0.76

Source: prepared by the authors based on Rosstat data.

indicating substantial disparities in the contribution of mining and quarrying across regions. In particular, this type of economic activity predominates in the Siberian, Ural, and Far Eastern federal districts.

Table 5
Descriptive statistics for the share of mineral extraction in GRP (%)

Federal district	Mean	Minimum	Maximum	Standard deviation	Coefficient of variation
CFD	2.00	0.00	19.20	5.24	2.62
NWFD	14.65	0.00	79.20	25.15	1.72
SFD	7.64	0.50	48.00	16.38	2.15
NCFD	0.74	0.10	1.50	0.53	0.71
VFD	10.51	0.00	40.80	14.00	1.33
UFD	27.75	1.00	72.50	34.35	1.24
SibFD	14.50	0.30	29.20	12.14	0.84
FEFD	23.35	1.00	64.30	22.20	0.95
Russian Federation (total)	11.52	0.00	79.20	18.67	1.62

Source: prepared by the authors based on Rosstat data.

Descriptive statistics for the share of manufacturing in GRP by federal districts are presented in Table 6.

Table 6
Descriptive statistics for the share of manufacturing in GRP (%)

Federal district	Mean	Minimum	Maximum	Standard deviation	Coefficient of variation
CFD	22.17	11.80	38.20	8.76	0.40
NWFD	20.32	0.20	38.30	11.14	0.55
SFD	10.56	0.80	24.40	7.71	0.73
NCFD	5.97	1.90	11.50	3.68	0.62
VFD	22.68	11.40	31.10	5.88	0.26
UFD	17.45	1.70	32.20	13.12	0.75
SibFD	15.61	0.70	36.30	11.62	0.74
FEFD	4.44	0.30	9.40	3.53	0.80
Russian Federation (total)	16.19	0.20	38.30	10.71	0.66

Source: prepared by the authors based on Rosstat data.

Descriptive statistics for the share of wholesale and retail trade in GRP by federal districts are presented in Table 7.

Table 7
Descriptive statistics for the share of trade in GRP (%)

Federal district	Mean	Minimum	Maximum	Standard deviation	Coefficient of variation
CFD	14.38	9.00	25.30	4.04	0.28
NWFD	9.05	0.70	16.10	4.28	0.47
SFD	11.78	5.10	15.90	4.01	0.34
NCFD	14.09	8.90	20.30	3.86	0.27
VFD	10.83	6.20	16.40	2.65	0.24
UFD	7.97	1.70	12.90	4.83	0.61
SibFD	10.36	5.20	15.60	3.36	0.32
FEFD	8.82	3.70	15.90	3.78	0.43
Russian Federation (total)	11.19	0.70	25.30	4.29	0.38

Source: prepared by the authors based on Rosstat data.

Indicators of Entrepreneurial and Investment Activity

A substantial body of domestic research highlights the role of small and medium-sized enterprises (SMEs) in the socio-economic development of Russian regions. First, SMEs play an important role in employment creation and the expansion of self-employment at the regional level. A study conducted by the Institute of Economics of the Russian Academy of Sciences [Vilensky, 2021] notes that "SMEs generate jobs while simultaneously creating additional demand for labor." Second, the contribution of SMEs to regional development is manifested in their capacity to satisfy local demand and supply specialized goods and services adapted to regional market conditions [Vilensky, 2021]. In addition, the influence of small and medium-sized enterprises on regional economic development extends to fiscal, social, and innovation-related dimensions. Research conducted by the Vologda Research Center of the Russian Academy of Sciences [Mazilov, Kremin, 2018] concludes that "small business represents a core component of the region's socio-economic system at the federal, regional, and municipal levels. Its most significant impact is observed at the municipal level, where small enterprises create conditions for accelerated economic growth by stimulating the development and saturation of local markets, mitigating the adverse effects inherent in a market economy (unemployment, cyclical fluctuations, and crisis phenomena), and facilitating the mobilization of available resource potential to improve overall socio-economic development." To reflect interregional differences in SME development, the share of small and medium-sized enterprises was incorporated into the set of clustering variables.

Descriptive statistics for the share of SMEs by federal districts are presented in Table 8.

According to Rosstat, fixed capital investment is defined as "the aggregate of expenditures directed toward

Table 8
Descriptive statistics for the share of small and medium-sized enterprises (SMEs) (%)

Federal district	Mean	Minimum	Maximum	Standard deviation	Coefficient of variation
CFD	29.37	22.00	42.20	4.95	0.17
NWFD	20.53	1.50	32.20	9.26	0.45
SFD	26.24	14.60	34.20	6.69	0.25
NCFD	29.96	21.20	38.50	5.40	0.18
VFD	26.69	17.00	34.20	4.73	0.18
UFD	18.68	2.50	27.70	11.58	0.62
SibFD	22.54	11.40	36.90	8.78	0.39
FEFD	19.83	8.00	32.10	7.03	0.35
Russian Federation (total)	24.74	1.50	42.20	7.93	0.32

Source: prepared by the authors based on Rosstat data.

the construction and reconstruction (including expansion and modernization) of facilities resulting in an increase in their initial value; the acquisition of machinery, equipment, vehicles, and production and household inventories; the formation of working, productive, and breeding livestock; and the planting and cultivation of perennial crops."

Recent studies, including the work of N.S. Gichiev from the Dagestan Federal Research Center of the Russian Academy of Sciences, emphasize that "the share of fixed capital investment represents one of the most important indicators determining a region's level of technological leadership" [Gichiev, 2021]. Attention should also be drawn to the study conducted by researchers from the Ryazan State Agrotechnological University named after P.A. Kostychev [Minat, Sudakova, 2020 which presents a cluster analysis of regions based exclusively on variables describing regional investment processes. For this reason, the indicator was included among the variables used for regional clustering.

Descriptive statistics for fixed capital investment growth by federal districts are presented in Table 9.

Table 9
Descriptive statistics for investment growth in fixed capital (%)

Federal district	Mean	Minimum	Maximum	Standard deviation	Coefficient of variation
CFD	106.0	79.2	124.6	12.2	0.11
NWFD	88.8	61.6	119.4	15.9	0.18
SFD	99.5	72.2	133.7	20.6	0.21
NCFD	104.2	95.5	116.7	6.5	0.06
VFD	102.8	90.8	119.0	7.9	0.08
UFD	102.8	80.3	140.1	21.1	0.20
SibFD	111.2	88.6	131.9	15.7	0.14
FEFD	110.5	66.9	149.1	23.9	0.22
Russian Federation (total)	103.4	61.6	149.1	16.5	0.16

Source: prepared by the authors based on Rosstat data.

Retail Market Indicators

This group of indicators was incorporated into the set of clustering variables, given the specific objective of conducting a comparative assessment of competition levels across regions. In the study by Markhaichuk [2018], a statistically significant positive relationship was identified between the development of both online and offline retail and the level of gross regional product (GRP). To characterize regional retail trade, two indicators are employed: retail turnover per capita and the structure of retail turnover.

Descriptive statistics for retail turnover per capita by federal districts are presented in Table 10.

Table 10
Descriptive statistics for retail trade turnover per capita (RUB thsnd)

Federal district	Mean	Minimum	Maximum	Standard deviation	Coefficient of variation
CFD	222.7	171.6	403.4	59.3	0.27
NWFD	215.3	170.2	278.0	31.7	0.15
SFD	180.0	83.2	258.3	56.2	0.31
NCFD	138.2	51.7	191.6	54.0	0.39
VFD	179.7	123.3	244.2	41.7	0.23
UFD	228.0	144.8	277.5	59.6	0.26
SibFD	159.0	80.3	201.7	34.3	0.22
FEFD	225.4	163.3	327.6	47.6	0.21
Russian Federation (total)	196.9	51.7	403.4	55.5	0.28

Source: prepared by the authors based on Rosstat data.

Descriptive statistics for the structure of retail turnover by federal districts are presented in Table 11.

Table 11
Descriptive statistics for the structure of retail trade turnover (%)

Federal district	Mean	Minimum	Maximum	Standard deviation	Coefficient of variation
CFD	48.22	39.00	53.90	3.73	0.077
NWFD	51.25	34.30	64.70	7.96	0.155
SFD	44.23	27.20	50.90	7.61	0.172
NCFD	48.91	45.40	51.40	2.16	0.044
VFD	47.76	44.80	51.30	1.74	0.036
UFD	47.13	46.00	48.70	1.06	0.022
SibFD	47.62	44.20	51.70	2.09	0.044
FEFD	53.55	46.00	69.90	6.94	0.130
Russian Federation (total)	48.76	27.20	69.90	5.35	0.110

Source: prepared by the authors based on Rosstat data.

Output and Labor Productivity Indicators

To assess the dynamics of regional development, the labor productivity index is used. According to the Rosstat methodology, this indicator is calculated as "the ratio of the physical volume index of gross domestic product to the index of changes in total labor input."

Descriptive statistics for the labor productivity index by federal districts are presented in Table 12.

As shown in the study by Ismailova and Kupyanskaya [2019], which examines labor productivity across the

Table 12
Descriptive statistics for the labor productivity index (%)

Federal district	Mean	Minimum	Maximum	Standard deviation	Coefficient of variation
CFD	102.4	97.7	108.0	2.46	0.024
NWFD	102.5	100.7	106.1	1.72	0.017
SFD	103.1	98.9	106.3	2.44	0.024
NCFD	102.3	99.2	108.4	3.19	0.031
VFD	103.5	100.2	106.3	1.80	0.017
UFD	100.9	96.8	104.8	3.28	0.033
SibFD	102.7	99.9	105.4	1.66	0.016
FEFD	104.7	99.8	114.2	4.37	0.042
Russian Federation (total)	102.9	96.8	114.2	2.72	0.026

Source: prepared by the authors based on Rosstat data.

regions of the Russian Federation, "labor productivity serves as a key efficiency indicator affecting GDP and GRP performance, the level of economic development, and the competitiveness of both the country and its regions. "

3. Description of the Clustering Method

The implementation of cluster analysis involves a sequence of methodological steps, including:

- normalization of statistical data for the selected indicators;
- identification of the set of variables used for clustering;
- selection of an appropriate distance metric in multidimensional space;
- choice of a suitable statistical clustering method;
- determination of the optimal number of clusters, taking into account the distribution of the data.

Data normalization is required to ensure the comparability of measurement scales across all indicators [De Souto et al., 2008] and to ensure that the mean value of each normalized variable across the full regional sample equals zero. For example, gross regional product (GRP) is measured in thousands of rubles, while the values observed for individual regions may reach several billion rubles. At the same time, the share of agriculture in GRP is expressed in percentage terms, that is, as fractions of one. If distances between regions are calculated using non-normalized data, variables with larger numerical scales will dominate the differentiation process due to differences in measurement units. As a result, GRP expressed in monetary terms would exert a disproportionate influence on the clustering outcome, whereas the contribution of indicators measured in percentage terms would become negligible. To avoid such distortions, all variables must be transformed to a common scale prior to clustering. During normalization, data for all regions are compiled into a single dataset, and the following statistics are calculated for each variable:

1) the mean value of the k-th variable M_{rk} across all regions ($r = 1, \ldots, R$, where R – is the total number of regions, $k = 1, \ldots, K$, where K is the total number of variables)
2) the standard deviation of the k-th variable S_{rk} across all regions ($r = 1, \ldots, R$, where R is the total number of regions, $k = 1, \ldots, K$, where K is the total number of variables)
3) the normalized value of each variable is then obtained as:

$$NF_{rk} = (F_{rk} - M_{rk}) / S_{rk}, \quad (1)$$

where F_{rk} – denotes the original value of the k-th indicator in region r, and NF_{rk} – represents its normalized value.

Within the framework of this study, the units of observation are the constituent entities of the Russian Federation, each represented as a point in a multidimensional space defined by the selected clustering variables. To measure distances between normalized observations, Euclidean distance is

Table 13
Configurations of variables used for cluster formation

Configuration code	Set of variables included in the configuration
"Agriculture"	GRP, population, share of agriculture in GRP
"Mining"	GRP, population, share of mining in GRP
"Manufacturing"	GRP, population, share of manufacturing in GRP
"Trade"	GRP, population, wholesale and retail trade; repair of motor vehicles and motorcycles
"GRP structure"	GRP, population, share of agriculture in GRP, share of mining in GRP, share of manufacturing in GRP
"SMEs"	GRP, population, share of small and medium-sized enterprises
"Investment"	GRP, population, investment growth in fixed capital
"Productivity"	GRP, population, labor productivity index
"Retail"	GRP, population, retail trade turnover per capita, structure of retail trade turnover

Source: prepared by the authors.

employed, which represents one of the most widely used approaches in econometric research. The distance between two regions is calculated as:

$$D_{ij} = \sqrt{\sum_{k=1}^{K} (NF_{ik} - NF_{jk})^2}, \quad (2)$$

where I and j denote the indices of the regions being compared, K – is the number of variables included in the algorithm, and NF_{ik}, NF_{jk} are the normalized values of the k-th variable for regions i and j, respectively.

The Euclidean distance metric is introduced as a measure of similarity between regional characteristics. When the economic indicators of two regions are close in magnitude (in the limiting hypothetical case, identical), the Euclidean distance calculated using normalized variables approaches a small value (or zero in the case of identical values).

To perform the econometric clustering procedure, the k-means method was applied. This approach belongs to the class of non-hierarchical clustering techniques and is based on the identification of centroids, with observations assigned to clusters according to their proximity to these centroids [Teknomo, 2006]. The k-means algorithm is widely used for clustering objects represented by vectors of measurable parameters and is frequently applied in regional economic studies [Akhunov, 2015]. A key feature of the k-means method is that the number of clusters must be specified in advance. Consequently, the structure and distribution of the dataset must be carefully considered prior to clustering.

At the initial stage, centroids for the prospective clusters are randomly generated in a number corresponding to the predefined number of clusters. Each observation is then assigned to the centroid to which it has the smallest Euclidean distance, thereby forming preliminary clusters.

Subsequently, new centroids are recalculated for each cluster as the mean values of all variables for the observations included in that cluster. Following centroid updating, the reassignment procedure is repeated, with observations redistributed based on proximity to the updated centroids. This iterative process continues until cluster membership stabilizes and no further changes occur. The resulting groups formed around the final centroids constitute the target clusters.

One limitation of the k-means method is its sensitivity to the random initialization of centroids. To mitigate this issue, an enhanced procedure was applied. The clustering algorithm was executed repeatedly (1,000 or more iterations), with the final metric calculated as the total distance between observations and their corresponding centroids. The cluster configuration minimizing this metric was selected as the final solution.

The subsequent stage of clustering involves determining the appropriate number of clusters. Following the approach proposed by Akhunov [2015], who conducted a clustering of Russian regions based on socio-economic development levels, an initial number of five clusters was adopted. However, empirical observations necessitated an important adjustment. The specific distribution of regional economies reveals the presence of a region that substantially deviates from national averages in terms of both GRP and population size—namely, the city of Moscow [Tebekin, 2019]. Preliminary clustering results consistently formed a separate cluster consisting solely of Moscow. Given this feature, the clustering procedure was conducted with five initial clusters; however, the single-element cluster representing Moscow was subsequently merged with one of the remaining four clusters based on proximity to the corresponding centroid. As a result, four final clusters were identified, within which regions were grouped according to similarity in economic indicators.

In total, nine alternative configurations of clustering variables were examined in the analysis (Table 13).

The results of the cluster analysis for all listed configurations are presented below, followed by a comparative assessment aimed at identifying the optimal configuration of variables.

4. Results of the Cluster Analysis

The k-means clustering method was applied to 85 regions of the Russian Federation using data for 2019. This year was selected as representative for two main reasons. First, comprehensive official statistics on the socio-economic development of Russian regions for 2021 were not yet fully available at the time of the study. Second, regional economic indicators for 2020 were significantly affected by the acute phase of the COVID-19 pandemic [Zubarevich, 2021; Mirolyubova, Voronchikhina, 2021], which could lead to biased quantitative estimates and distort analytical conclusions.

The analysis was conducted using nine configurations of variables. The clustering results for each configuration are presented below.

Configuration 1: Agriculture

The results of clustering analysis based on configuration 1 ("Agriculture") are presented in Table 14.

Table 14
Cluster characteristics for configuration 1: Agriculture

Cluster	1	2	3	4
Number of regions	13	36	17	19
GRP (RUB, bln)	70-841	51-2,593	939-16,019	51-938
Population (mln)	0.3-3.1	0.0-2.0	1.7-12.6	0.2-2.8
Share of agriculture in GRP (%)	14.7-27.4	0.1-7.6	0.1-10.7	7.2-13.3

Source: prepared by the authors.

The selected set of variables predictably resulted in the division of Russian regions into four clusters: agricultural regions (13), two groups of non-agricultural regions (36 and 17), and an intermediate group (19). The non-agricultural regions formed two distinct clusters: regions with relatively

high GRP (17) and regions with comparatively low GRP (36).

Configuration 2: Mining

The results of the clustering analysis based on configuration 2 ("Mining") are presented in Table 15.

Table 15
Cluster characteristics for configuration 2: Mining

Cluster	1	2	3	4
Number of regions	51	14	11	9
GRP (RUB, bln)	51–1,043	60–2,201	649–16,019	79–3,114
Population (mln)	0.2–2.8	0.3–3.9	2.8–12.6	0.0–1.7
Share of mining and quarrying in GRP (%)	0.0–14.6	17.7–40.8	0.0–3.5	39.4–79.2

Source: prepared by the authors.

The variables included in this configuration resulted in the identification of the following clusters: intensively mining regions (9), non-mining regions (51 and 11), and regions characterized by a moderate level of mining activity (14).

The non-mining regions were further divided into two subgroups: regions with relatively low population and GRP (51) and regions with relatively high population and GRP (11). Regions belonging to the latter subgroup largely overlap with the cluster of non-agricultural regions with high GRP identified under configuration 1, with the exception of the Republic of Dagestan, which combines low mining activity with a large population and a well-developed agricultural sector.

Configuration 3: Manufacturing

The results of the clustering analysis based on configuration 3 ("Manufacturing") are presented in Table 16.

Table 16
Cluster characteristics for configuration 3: Manufacturing

Cluster	1	2	3	4
Number of regions	24	20	11	30
GRP (RUB, bln)	51–3,114	177–1,946	1,364–16,019	112–1,228
Population (mln)	0.0–3.1	0.6–2.9	3.2–12.6	0.5–2.8
Share of manufacturing in GRP (%)	0.2–9.5	22.9–38.3	10.4–32.2	8.3–20.8

Source: prepared by the authors.

This clustering configuration yields a different grouping pattern, as many regions with high GRP and large populations also demonstrate medium or high shares of manufacturing activity. As a result, regions were classified into the following categories: regions with a low manufacturing share (24), regions with a high manufacturing share and low GRP (20), regions with a high manufacturing share and high GRP (11), and regions with a medium manufacturing share (30).

Configuration 4: Trade

The results of the clustering analysis based on configuration 4 ("Trade") are presented in Table 17.

Table 17
Cluster characteristics for configuration 4: Trade

Cluster	1	2	3	4
Number of regions	26	17	12	30
GRP (RUB, bln)	51–938	51–3,114	649–16,019	63–1,395
Population (mln)	0.2–2.8	0.0–2.9	2.8–12.6	0.5–3.2
Share of trade in GRP (%)	12.3–18.8	0.7–7.9	10.3–25.3	8.0–12.0

Source: prepared by the authors.

The group of regions with the highest GRP (12) also exhibits the largest population size and the highest share of trade and vehicle repair in GRP. The remaining clusters are formed according to the following characteristics: a high share of trade and low population (26), a low share of trade (17), and a medium level of trade activity (30).

Configuration 5: GRP structure

The results of the clustering analysis based on configuration 5 ("GRP structure") are presented in Table 18.

Table 18
Cluster characteristics for configuration 5: GRP structure

Cluster	1	2	3	4
Number of regions	23	27	10	25
GRP (RUB, bln)	177–2,206	51–16,019	79–3,114	51–882
Population (mln)	0.6–4.3	0.2–12.6	0.0–2.0	0.2–3.1
Share of agriculture in GRP (%)	1.6–11.6	0.1–10.7	0.1–6.7	10.2–27.4
Share of mining and quarrying in GRP (%)	0.0–22.7	0.0–29.2	39.4–79.2	0.0–19.2
Share of manufacturing in GRP (%)	20.5–38.3	0.7–20.0	0.2–11.4	0.8–26.1

Source: prepared by the authors.

The inclusion of a larger number of variables leads to a more balanced distribution of regions across clusters compared with approaches based on a single sectoral indicator. Clusters are formed according to dominant specializations: mining regions (10), agricultural regions (25), manufacturing-oriented regions (23), and regions without a clearly defined specialization within the

GRP structure (27). Within each sectoral category, the dispersion of GRP and population levels is, on average, greater than in approaches based on a single dominant activity.

Configuration 6: SMEs

The results of the clustering analysis based on configuration 6 ("SMEs") are presented in Table 19.

Table 19
Cluster characteristics for configuration 6: SMEs

Cluster	1	2	3	4
Number of regions	11	11	32	31
GRP (RUB, bln)	60–3,114	1,364–16,019	63–1,190	51–1,228
Population (mln)	0.0–2.9	3.2–12.6	0.4–3.1	0.1–2.7
Share of small and medium-sized enterprises (SMEs) (%)	1.5–15.2	22.0–34.2	26.9–42.2	17.0–26.4

Source: prepared by the authors.

The algorithmic grouping identified the following clusters: regions with a low share of SMEs in GRP and low population (11), regions with a high share of SMEs and high population (11), regions with a high share of SMEs and low GRP (32), and regions with a medium level of SME development (31). The group of regions with the highest GRP nationwide exhibits an above-average share of small and medium-sized enterprises; however, this indicator is not the highest among all clusters.

Configuration 7: Investment

The results of the clustering analysis based on configuration 7 ("Investment") are presented in Table 20.

Table 20
Cluster characteristics for configuration 7: Investment

Cluster	1	2	3	4
Number of regions	11	37	17	20
GRP (RUB, bln)	51–692	63–968	51–2,593	649–16,019
Population (mln)	0.0–1.9	0.0–2.4	0.1–1.9	1.7–12.6
Investment in fixed capital growth (%)	119.4–149.1	93.8–117.2	61.6–92.3	81.5–124.6

Source: prepared by the authors.

The clustering algorithm identified groups conventionally characterized by the following features: the highest growth in fixed capital investment (11), the lowest level of fixed capital investment (17), a medium level of fixed capital investment combined with low GRP (37), and a medium level of fixed capital investment combined with high GRP (20). As in the SME-based clustering, the group of regions with the highest GRP does not exhibit the highest value for the selected indicator.

Configuration 8: Productivity

The results of the clustering analysis based on configuration 8 ("Productivity") are presented in Table 21.

Table 21
Cluster characteristics for configuration 8: Productivity

Cluster	1	2	3	4
Number of regions	5	24	19	37
GRP (RUB, bln)	144–938	51–2,593	649–16,019	51–1,082
Population (mln)	0.7–1.9	0.1–2.4	1.7–12.6	0.0–2.4
Labor productivity index (%)	108–114.2	103.4–106.3	98.5–104.9	96.8–102.9

Source: prepared by the authors.

This configuration identified a group of five regions with the highest labor productivity index, a group with above-average labor productivity (24), a group with a medium index level (19), which also includes regions with large population size and high GRP, and a group characterized by a low labor productivity index (37). The latter group is also associated with a comparatively low level of GRP. For this indicator, the clustering produced the most uneven distribution of regions across clusters.

Configuration 9: Retail

The results of the clustering analysis based on configuration 9 ("Retail") are presented in Table 22.

Table 22
Cluster characteristics for configuration 9: Retail

Cluster	1	2	3	4
Number of regions	5	30	27	23
GRP (RUB, bln)	79–693	51–1,364	51–739	112–16,019
Population (mln)	0.0–1.3	0.2–3.5	0.1–3.1	0.5–12.6
Retail trade turnover per capita (RUB, thsnd)	197–262	52–184	165–242	191–403
Share of food products in retail trade (%)	59.4–69.9	39.6–51.4	45.9–56.1	27.2–53.9

Source: prepared by the authors.

The retail-related variables used in this configuration identified the following conditional groups: regions with the highest share of food products in retail trade and below-average population (5), regions with a medium share of food products combined with low GRP and retail trade turnover

Table 23
Socio-economic clusters of the constituent entities of the Russian Federation

Economic structure	Economic scale	Number of regions
Diversified		
No single dominant economic activity (over 30% of GRP)	Population above 0.5 mln; GRP above 1,000 RUB bln, or GRP per capita above 420 thousand RUB	11
Industrial		
Mining or manufacturing account for more than 25% of GRP individually, or more than 30% of GRP in total	GRP per capita above 300 thousand RUB	37
Agricultural		
Share of agriculture in GRP ≥ 10%; share of extractive industries or manufacturing ≤ 25%	GRP per capita above 300 thousand RUB	15
Developing		
No dominant economic activity combined with GRP per capita below 420 thousand RUB	High share of agriculture combined with GRP per capita below 200 thousand RUB	22 + 4*

* The new constituent entities of the Russian Federation (Donetsk People's Republic, Luhansk People's Republic, Zaporizhzhia Region, and Kherson Region) are provisionally assigned to the cluster of developing regions until official statistical data for a representative year become available.

Source: prepared by the authors.

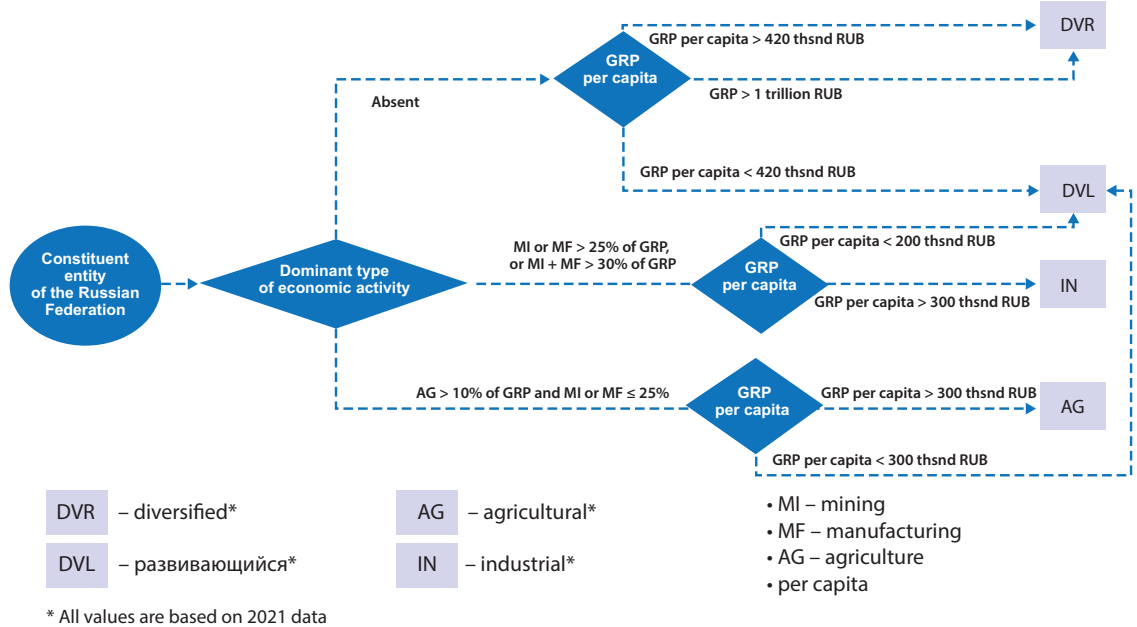
(30), regions with medium levels of both retail indicators and low GRP (27), and regions with high retail trade turnover and high GRP (23). Notably, the group of regions with the highest GRP and population exhibits high, but not the highest nationwide, levels of retail trade activity.

Final set of clusters

During the analysis, several regularities in the clustering of regions were identified. A group of five regions—namely, Moscow Region, the city of Moscow, the city of Saint Petersburg, Krasnodar Krai, and Rostov Region—was assigned to the same cluster across all examined configurations of variables. This indicates a high degree of similarity among these constituent entities with respect to the selected subset of economic indicators.

Arkhangelsk Region (excluding the Nenets Autonomous Okrug) was grouped together with Novgorod Region in all configurations, while never being assigned to the same cluster as the aforementioned group of five regions. This finding suggests that, although these two regions are similar to each other in terms of economic indicators, they are clearly differentiated from the group of leading regions identified above.

Fig. 4. Schematic representation of the algorithm for assigning regions to socio-economic clusters



Source: prepared by the authors.

Table 24
Distribution of constituent entities of the Russian Federation across socio-economic clusters

Cluster	Regions included
Industrial regions cluster	Arkhangelsk Region, Astrakhan Region, Belgorod Region, Vladimir Region, Volgograd Region, Vologda Region, Irkutsk Region, Kaliningrad Region, Kaluga Region, Kemerovo Region – Kuzbass, Krasnoyarsk Krai, Lipetsk Region, Magadan Region, Nenets Autonomous Okrug, Novgorod Region, Omsk Region, Orenburg Region, Perm Krai, Republic of Bashkortostan, Republic of Karelia, Republic of Komi, Republic of Sakha (Yakutia), Republic of Khakassia, Ryazan Region, Samara Region, Sakhalin Region, Sverdlovsk Region, Tomsk Region, Tula Region, Tyumen Region, Udmurt Republic, Ulyanovsk Region, Khanty-Mansi Autonomous Okrug, Chelyabinsk Region, Chukotka Autonomous Okrug, Yamalo-Nenets Autonomous Okrug, Yaroslavl Region.
Developing regions cluster	Amur Region, Sevastopol, Jewish Autonomous Region, Zabaykalsky Krai, Ivanovo Region, Kabardino-Balkarian Republic, Karachay-Cherkess Republic, Kirov Region, Kostroma Region, Kurgan Region, Kursk Region, Republic of Buryatia, Republic of Ingushetia, Republic of Crimea, Republic of Mari El, Republic of Mordovia, Republic of Tuva, Smolensk Region, Tver Region, Khabarovsk Krai, Chechen Republic, Chuvash Republic, Donetsk People's Republic*, Luhansk People's Republic*, Zaporizhzhia Region*, Kherson Region
Agricultural regions cluster	Altai Krai, Bryansk Region, Voronezh Region, Kamchatka Krai, Oryol Region, Penza Region, Pskov Region, Republic of Adygea, Republic of Altai, Republic of Dagestan, Republic of Kalmykia, Republic of North Ossetia–Alania, Saratov Region, Stavropol Krai, Tambov Region.
Diversified regions cluster	The city of Moscow, the city of Saint Petersburg, Krasnodar Krai, Leningrad Region, Moscow Region, Murmansk Region, Nizhny Novgorod Region, Novosibirsk Region, Primorsky Krai, Rostov Region, Republic of Tatarstan

* Newly incorporated constituent entities of the Russian Federation are provisionally assigned to the developing regions cluster pending the availability of official statistical data for a representative year.
Source: prepared by the authors.

In seven out of the nine configurations, Voronezh Region, Pskov Region, and Altai Krai were consistently grouped within the same cluster. This cluster remained distinct from both clusters identified for the previous two regional groups (the group of five regions and the pair of regions). In five of these seven configurations, the Republic of Adygea and Stavropol Krai were also included in the same cluster.

In six out of the nine configurations, Bryansk Region, Oryol Region, and Penza Region were consistently assigned to a single cluster.

Each of the analyzed configurations exhibits its own specific features and potential applicability for further analysis. This raises the question of their comparative performance and the selection of an "optimal" configuration. From this perspective, one possible optimality criterion is the minimization of dispersion in cluster size. In other words, when choosing among alternative configurations, preference may be given to those with the smallest difference between the largest and smallest clusters in terms of the number of regions they contain. Based on this criterion, configurations No. 5 ("GRP Structure"), No. 4 ("Trade"), No. 3 ("Manufacturing"), and No. 6 ("SMEs") can be considered the most balanced.

Based on the clustering results obtained across all configurations, four final socio-economic clusters were identified. Configuration "GRP Structure" was selected as the baseline. The clusters derived from this configuration were subsequently refined taking into account the scale of regional economies. As a result, the following clusters were formed: diversified regions (11 regions), industrial regions (37 regions), agricultural regions (15 regions), and developing regions (22 regions). The complete list of regions by cluster is presented in Table 23, while an approximate visual representation is provided in Figure 4.

Following the statistical clustering stage, an expert assessment stage was conducted. The results and patterns identified in the baseline configuration, as well as in the remaining eight alternative configurations, were systematized and presented to a panel of experts representing regional economic development authorities in various regions of the Russian Federation. This stage was considered necessary for two main reasons. First, regional expert judgment makes it possible to validate or refine the outcomes of the purely statistical analysis. Second, specialists in regional economics typically incorporate a wide range of considerations in their assessments, including qualitative characteristics that cannot be captured through official statistical data or subjected to quantitative processing. The experts were asked to evaluate the adequacy of the proposed grouping of Russian regions into four socio-economic clusters based on the results obtained under the nine model configurations. The survey was conducted using the Delphi method in two rounds. As a result, a final list of constituent entities of the Russian Federation was established for each cluster. This list is presented in Table 24. To ensure a comparable analysis of competition development, it is proposed that competition levels in product markets be compared within the cluster to which each region belongs.

Conclusion

Based on the work carried out to identify the list of priority product markets in accordance with the national goals and strategic objectives of economic development of the Russian Federation, the following key findings can be highlighted:

1. Product markets should be classified according to their geographic scope into federal, regional, and municipal markets, as well as according to the nature of

public intervention—into markets subject to federal-level influence and markets subject to regional and municipal influence.

2. In total, 30 priority markets were identified within the framework of the Standard. The development of competition in these markets should be carried out jointly by federal executive authorities, regional executive authorities, and local self-government bodies.

3. Nineteen markets are considered appropriate for assessing the performance of regional executive authorities in promoting competition. These markets are further subdivided into socially oriented markets and markets focused on value creation.

4. The constituent entities of the Russian Federation were classified into four socio-economic clusters using the k-means clustering method.

The approaches described in this study are proposed as an instrumental framework for the practical implementation of competition policy as articulated in regulatory acts, federal laws, government resolutions, and other foundational documents aimed at fostering competition in the constituent entities of the Russian Federation.

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