REGIONAL SPECIALIZATION AND DIVERSIFICATION OF INDUSTRIES IN KAZAKHSTAN

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ABSTRACT

This research aims to assess the degree of specialization and diversification in the regions of Kazakhstan. The method of calculating the location quotient is used to determine the degree of specialization of the regions. The industrial location quotient for three periods - 2010, 2015, and 2019 - is calculated to observe the dynamics of specialization of industries in the regions. The research identified sustainable, unstable, fading, and emerging. The degree of industrial diversification in the region is determined based on the number of sustainable industries in the region. The categorization of industries according to the dynamics of specialization makes it possible to apply various mechanisms and ways to recover fading industries and support unstable and emerging industries. The research results can be used in designing Kazakhstan's regional industrial and innovation policies.

Keywords: rational allocation; productive forces; regional development; specialization; territorial development; competitive advantages; industrial policy

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INTRODUCTION

Ensuring balanced territorial development of the country's economy and social sphere is highlighted as an important national development priority in Kazakhstan's president's address to the people of Kazakhstan on September 1, 2021. Balanced regional development and rational distribution of

productive forces should be based on the need to change the exploitative specialization of the national economy and overcome distortions and imbalances in territorial development. This requires new approaches to regional policy and the distribution of productive forces according to the competitive advantages of regions based on their rational specialization.

Specialization measures how specialized (or diversified) the economy of a particular region is and measures the industry's importance to that region's economy (Dan & Gleave, 2004). Specialization implies relatively higher productivity of resources concentrated and invested in certain industries since their concentration in a given area is associated with relative or absolute advantages (Minakir, 2019). It is obvious that, as a result, the profitability increases with the degree of industry localization, and the effect is stronger for more prominent companies (Zyuzin et al., 2020).

In Kazakhstan, different regions are usually distinguished: industrial, extractive, agricultural, and service regions (Alzhanova et al., 2020). Such specialization has developed in history under the influence of multidirectional factors. As a result, significant differences in the socioeconomic development of the regions have emerged.

In the administrative command system period, when the foundations were laid for Kazakhstan's present economic area, the production location was dictated by political reasons, not purely economic considerations. Factors that were taken into account were proximity to raw materials and energy, and a lesser extent, transportation, and labor availability. Of the institutional factors, only the availability of infrastructure for production was considered; the market factor was not considered for obvious reasons. As a result, a very heterogeneous economic space has developed in Kazakhstan, characterized by significant disproportions in the territorial distribution of economic activity. A similar situation can be observed in many countries and is explained primarily by natural and geographical factors.

In Kazakhstan, these factors are powerful because, on the one hand, the country occupies a huge territory and, on the other, it has a relatively small population. If in terms of territory, the country ranks 9th in the world, in terms of population, it ranks only 63rd. In terms of population density, our country ranks 184th in the world. At the same time, Kazakhstan has a small economy. In terms of GDP, it ranks 48th in the world. It is quite understandable that achieving a more even distribution of economic activity over the whole territory with such indicators is difficult, especially if we consider the historical features of economic development.

A modern theoretical concept that explains the reasons for the unequal distribution of production is the "new economic geography" of P. Krugman, for the development of which he received the Nobel Prize in Economics in 2008 (Krugman, 1991). Among the most important conditions affecting the localization of production in certain areas, P. Krugman singled out two groups of factors. He called the first group "first nature" factors: endowment with natural resources and favourable geographical location. These factors, also called basic factors, are not subject to man and do not depend on his activity. Another group is the "second nature" factors - human capital, institutional environment, and infrastructure - which are directly shaped by government policies and business activities. These factors together form a given area's comparative advantages and influence the production cost level.

Geographical conditions and resource potentials were, for a long time, decisive for the location of production. Countries and regions with favourable "first kind" factors in the industrial age received economic growth and spatial development advantages. During the transition to post-industrialism, the importance of these factors has diminished, and other factors create favourable conditions for spatial modernization. In the World Bank's 2009 report on spatial development, three factors, in particular, are identified as fundamental. First, this is the spatial concentration of the population and the formation of urban agglomerations. Second is economic distance, which depends on inland location, distance to world and intranational markets, and transportation costs. Third, these are institutional factors, including tariff restrictions on the movement of goods, capital, and labour.

The manufacturing base will be more successful the faster the barriers associated with these three factors are overcome, i.e., provide for greater population concentration and human capital growth, develop transportation and communications infrastructure, reduce

economic distances, and remove institutional barriers.

Shifts in the specialization of regions are a very inert and long-term process, but this does not mean that existing specialization is unshakable and permanently entrenches negative trends in the socioeconomic development of regions. The industrial location is crucial to evaluating the economic conditions of a region or city (Akın & Seyfettinoglu, 2022). Overcoming regional disparities should be one of the main goals of the country's spatial development policy. To justify such a policy, it is necessary to evaluate the specialization of industries in regions of the country over the long term.

The research aim is to reveal the degree of sustainability of specializations in the regions of Kazakhstan through 2010, 2015, and 2019 years and give recommendations for the country's spatial development policy. The objectives of the research are: to identify the current sectoral profile of the regions, to assess the specialization of regions in three periods, to reveal trends of specialization in every region and industry, to categorize the industries in terms of the specialization trends, to evaluate the degree of diversification sustainability of the manufacturing industry and to make recommendations for the spatial development policy.

THEORETICAL FOUNDATIONS OF REGIONAL SPECIALIZATION

The phenomenon of specialization is based on two groups of theories: international trade theories and the theories of location. The international trade theories group comprises the classical theories of trade (A. Smith, D. Ricardo, E. Heckscher, B. Ohlin, Leontieff) and the theory of new trade (P. Krugman, E. Helpman).

In his theory of absolute advantage, Adam Smith states that international trade is profitable if two countries trade goods that each country produces at a lower cost than the partner country. Later D. Ricardo, in 1817, showed that in the transition from a closed economy to an open model, the prices of goods and factors change to ensure the specialization of countries in industries of comparative advantage. He demonstrates that, in this case, both countries benefit from trade.

The theory of international trade was also explained through the theory of factors of production. Its authors are E. Heckscher and B. Ohlin, Swedish economists (mid-1920s). Following the Heckscher-Ohlin theory, the difference in the relative prices of goods in different countries, and hence the trade between them, is explained by the different relative endowments of countries with factors of production.

In the 1950s, V. Leontief found that the Heckscher – Ohlin theory of the ratio of factors of production is not confirmed in practice: labor-intensive countries export capital-intensive products, while capital-intensive countries export labor-intensive ones (Leontief's paradox).

Location theories. This group of theories includes economic geography and new economic geography theories (V. Thunen, A. Weber, W. Alonso, W. Christaller, Krugman, P.). However, the former does not explain only international specialization, and the latter does not explain only the national level. Research shows that these theories have developed together and in mutual connection.

In economics and geography, location theory is the theory of the geographic distribution of economic activities; it has become an integral part of economic geography, regional studies, and spatial economics. Location theory answers questions about the placement of economic activities and their causes. In the optimization process, which involves maximizing profits or minimizing costs, the firm chooses the best possible location from a given set of options and constraints when deciding on placement.

Thunen's theory of agricultural distribution (1826) suggests that access to a market (city) could create a coherent system for agricultural land use. Alfred Weber formulated the theory of industrial locations (1909), which states that the optimal place for producing a good is a triangle whose vertices are the market and the sources of raw materials.

An important contribution to location theory was Walter Christaller's 1933 theory of central places, which provided geometric explanations of how settlements and places are arranged about each other and why settlements function as villages, cities, or towns.

In 1964, William Alonso refined Thunen's model in terms of intra-urban differences in land use. According to his theory, each land use type

has its rent trajectory or rent curve. The curve sets the maximum amount of rent that each type of land use can bring to a particular location.

Thus, the theories of Thunen, Weber, Alonso, and Christaller form the basis of the theory of location. The location theory is microeconomic in that the unit making location decisions is small enough that supply and demand are considered completely independent (Robinson, 1969).

Geographers, economists, and regional scientists expanded and refined the theories. Paul Krugman's assumption of increasing returns to scale at the firm level and the model of monopolistic competition fundamentally changed the conclusions of standard models and enriched our understanding of both international trade and the principles of the spatial distribution of economic activity (P. Krugman, 1991). Krugman succeeded in creating new equilibrium models in spatial economics by linking international trade theory, industrial organization, and traditional location theory and linking the agglomeration process to globalization and the development of international trade. He argued that increasing returns, rather than comparative advantages, explain the specialization of countries and trade with each other (Krugman, 1999).

Empirical studies revealed that the geographical proximity of the customer's market is an important factor for SME location decision-making, while the possibility of gaining a unique market position is an insignificant factor (Damborský & Wokoun, 2010). Start-up location decisions are reasoned by positive government support, although network support is more significant (Simarasl et al., 2021). For the ICI-1000, the location choice depends on the high market power and market growth, qualified and abundant labour, high sectoral growth and diversity, and good geographical and physical conditions (Akın & Seyfettinoğlu, 2022).

Specialization of countries and concentration of industries are interpreted as "two sides of the same coin". The specialization models originate from trade theory, and the concentration models - from location theory (Aiginger & Davies, 2004). Trade theory explains specialization through the redundancy of resources, while location theory explains concentration through the causes of agglomeration and dispersion. In traditional economic theories, the absolute and relative advantages that lead to industrial concentration in a country play an important role in shaping specialization in international trade. In location and economic geography theories, agglomerations are considered to play the main role in forming regional specialization (Kopczewska et al., 2017).

METHODOLOGY

The location quotient is one of the most popular and simplest calculation methods due to the limited data requirements and ease of interpretation (Tian, 2013). The location quotient (LQ) determines a region's critical mass of activity. It shows where knowledge and skills are concentrated and where value is added to the economy (Dzemydait ̇e, 2021). The location quotient is used to measure and map relative distributions or relative concentrations of a subarea to the area as a whole (Kimberly, 2005). The basic idea of the location quotient was a broader concept for analyzing the economic base proposed by Heig in 1928. According to this concept, the economy is divided into two categories: base industries, which build the region's wealth through exports, and non-base industries, which support the base industries. The location quotient determines whether an industry is a base or non-base industry.

Based on the theory of comparative advantage (D. Ricardo), it is assumed that if LQ >1.25, the region can be classified as a potential exporter, and when the LQ <1 - as a potential importer. However, this approach was widely criticized for its sensitivity to data sets (by region and industry), and global linkages between production and consumption. There was also a technical issue related to intermediates produced and consumed in the same region that was "invisible" to export potential (Kopczewska et al., 2017).

Porter (1998) proposed the calculation of the location quotient is the ratio of the share of employees in the industry in the region to the share of employees in that industry in the country (Porter, 1998) or is the ratio of the share of processed products of the industry in the region to the share of industrial production in the region. The high location quotient values can uncover clusters (Crawley & Hallowell, 2021). The location quotients are sensitive to the level of industry aggregation, how regions are defined, and the choice of the benchmark (Pominova, 2021). A limitation of the location quotient is

their difficulty in measuring industry specialization in very small regions due to their small size (Tian, 2020).

In this study, the method of calculating the degree of specialization based on the location quotient was used as the most accessible and acceptable in terms of data research project specifications.

The location quotient is calculated as the ratio of the share of processed products of the industry in the region to the share of industrial production in the region:

$$LQ = \left(\frac{V_{bc}}{V_{br}} \times 100\right) : \left(\frac{V_{ic}}{V_{ir}} \times 100\right), \text{ where} \quad (1)$$

LQ – location quotient;

Vbc - industry output in the region;

Vbr - industry output in the country;

Vic - total manufacturing output in the region;

Vir - total manufacturing output in the country.

In the first stage of determining the degree of specialization of the regions of Kazakhstan, the current sectoral profile of the regions was analyzed in the context of economic sectors by calculating their share in the gross regional product of the Republic of Kazakhstan.

In the second phase, the location quotient for industries and industrial production sectors was calculated for three periods - 2010, 2015, and 2019 - to observe the specialization dynamics of sectors in the regions. The choice of these periods is justified by the periods of implementation of the state industrialization programs in Kazakhstan: the first program - from 2010 to 2014 and the second program – from 2015 to 2019. The data sources for calculating LQ are the national statistics committee on the volume of industrial production by types of economic activity in the regions of Kazakhstan for 2010, 2015, and 2019 years.

In the third stage, the degree of sustainability of specialization of the regions was determined based on the following parameters:

- Sustainable specialization (LQ greater than 1 in all three periods);
  unstable specialization (LQ greater or less than 1 in three periods, specialization fluctuates);
- declining specialization (LQ greater than 1 in 2010 and declining in subsequent periods - specialization disappears);
- Emerging specialization (LQ was less than 1 in the first and/or second period, in the 3rd period, it became greater than 1 - specialization occurred).

In the fourth stage, the degree of sustainability of manufacturing diversification was determined by the number of sustainable specializations.

DISCUSSION

In the first stage of determining the specialization of the regions of Kazakhstan, the profile of the regions was analyzed in the context of sectors (primary, secondary, and tertiary) and industries (extractive, manufacturing industry, and agriculture). For this purpose, the share of these sectors and industries in the gross regional product of the Republic of Kazakhstan was calculated (Table 1).

Table 1. Share of sectors and branches of the economy in the gross regional product (GRP) of the Republic of Kazakhstan, 2020.

Regions	Primary sector		Secondary sector	Tertiary sector and construction
	Mining and quarrying	Agriculture	Manufacturing	
Akmola	3,9	16,5	24,3	55,3
Aktobe	19,9	6,2	11,8	62,1
Almaty	0,3	15,8	24,3	59,6
Atyrau	38,4	1,0	5,3	55,3
West Kazakhstan	38,9	4,2	4,9	52.0
Zhambyl	2,9	11,2	15,1	70,8
Karaganda	13,1	3,8	31,4	51,7

Table 1. Continued

Kostanay	12,5	12,5	19,5	55,5
Kyzylorda	21,3	6,0	6,1	66,6
Mangystau	44,5	0,8	4,4	50,3
Turkestan	8,8	6,0	29,0	56,2
Pavlodar	0,2	27,9	10,6	61,3
North Kazakhstan	7,5	18,7	8,0	65,8
East Kazakhstan	15,1	8,9	23,0	53.0
Astana city	0	0,1	6,3	93,6
Almaty city	0	0	4,6	95,4
Shymkent city	0	1,0	22,1	76,9

Source: Calculated by the authors based on statistical data, 2020. URL https://stat.gov.kz/official/industry

Thus, the profile of regions with dominant industry specialization without considering the tertiary sector is revealed:

- Manufacturing industry - Karaganda (31.4%), Turkestan (29.0%), Akmola (24.3%), Almaty (24.3%), East Kazakhstan (23.0%), Kostanay (19.5%), Zhambyl (15.1%) regions;
- Mining and quarrying - Mangystau (44.5%), Atyrau (38.4%), West Kazakhstan (38.9%), Aktobe (19.9%), Kyzylorda (21.3%) regions and Shymkent city (22.1%);
- Agriculture - Pavlodar (27.9%), North Kazakhstan (18.7%) regions.
- In Almaty and Astana cities, the share of the primary sector is almost zero, and the secondary sector is very small (4.6% and 6.3%, respectively).

Further, the calculation of localization coefficients by branches and sectors of industrial production for three periods - 2010, 2015, and 2019 made it possible to identify the dynamics of the localization coefficients in the regions of Kazakhstan and determine the specializations' sustainability phase by classifying them into stable, unstable, fading and nascent industries (Table 2). Because the location quotient cannot fully capture the dynamics in the industry structure [**Error! Bookmark not defined.** we calculated it for three periods.

Table 2. Sustainability of specialization and diversification of manufacturing sectors in the region

Region	Number of manufacturing sectors with a specialization				Total specializations /Level of diversification
	Sustainable	Unstable	Fading	Emerging	
Almaty	20	2	1	-	23/H
Almaty city	20	-	2	2	24/H
Turkestan	19	3	-	2	24/H
Akmola	17	-	3	1	21/H
North Kazakhstan	17	-	5	1	23/H
East Kazakhstan	13	9	-	-	22/H
Kostanay	11	1	3	4	19/H
Pavlodar	11	2	5	2	20/H
Zhambyl	11	-	5	-	16/M
Astana city	10	2	7	1	20/H
Karaganda	8	6	4	3	21/H
Aktobe	4	1	2	2	9/M
Atyrau	2	-	-	-	2/L
West Kazakhstan	-	-	1	3	4/L
Kyzylorda	-	-	-	2	2/L
Mangystau	-	1	-	-	1/L

Source: Compiled by the authors. Note: H-high, M-medium, L-low

The results of calculating the location quotient by regions of Kazakhstan confirmed the continuing heterogeneity of the economic space. Calculations revealed regions with many sustainable specializations, such as Almaty, Turkestan, Akmola, North Kazakhstan regions and Almaty city (sustainable specialization in 17 - 20 manufacturing industry sectors). This means a higher level of diversification in comparison to the other areas. It is worth noting that the manufacturing industry grasps more than 20% of GRP in Almaty, Turkestan, and Akmola regions. Even though Almaty City and the North Kazakhstan region have a low share of the manufacturing industry (4.6 and 8.0%, respectively), they have many stable specializations (20 and 17, respectively).

In the East Kazakhstan and Karaganda regions, there are 9 and 6 unstable specializations, respectively, although they have a high share of the manufacturing industry (23% and 31.4%, respectively). Local authorities have to pay attention to them and take appropriate measures.

Karaganda region had a rather diversified level of specialization, accounting for 4 fading and 3 emerging specializations apart from 6 unstable specializations.

North Kazakhstan, Pavlodar, Zhambyl regions, and Astana City have 5-7 fading specializations. Supporting them can help them to take an advance.

In the structure of the Aktobe region economy, 11.8% falls on the manufacturing industry, 4 production sectors of which are characterized by a steady specialization, 1 - unstable, 2 - fading, and 2 - nascent. A well-thought-out and focused industrial policy for the region will also bring the region to a new level of industrialization and diversification.

Regions of medium-diversified manufacturing industry are the subject of analytical assessment and study by state bodies for the causes and factors of instability, extinction and the emergence of sectors and branches of the manufacturing industry to decide on its further diversification and development.

The rest of the country's western regions (Atyrau, West Kazakhstan, Kyzylorda, and Mangystau regions) belong to regions with a critically low level of development of the manufacturing industry (4-6%) without stable specializations. However, for the sake of justice, the tendency of the emergence of three specializations in West Kazakhstan and two in the Kyzylorda region should be noted.

It is reasonable to classify the regions by the number of total specializations as well. The diversification of specializations can be attributed to the diversification of the manufacturing industry. Thus, the manufacturing industries of Kazakhstan have different levels of diversification. Ten regions and two cities (Astana and Almaty) were found to have highly-diversified manufacturing (H). Zhambyl and Aktobe regions have medium-level (M) diversification, while the rest four west regions have low (L) diversification of the manufacturing industry. According to the studies, Kazakhstan is found as unable to achieve economic diversification due to over-dependence on oil revenues (Yasmin et al., 2020). Later it is found to have better productivity in the petroleum, manufacturing, construction, and food processing sectors (Yasmin et al., 2022).

Moreover, the country's GDP's share of mining and quarrying industries steadily decreases. It fell from 19% in 2010 to 12% in 2020. Continuing the industrialization and innovation policy and measures can improve diversification, and the economy can achieve sustainable economic growth in the long term.

CONCLUSIONS AND RECOMMENDATIONS

The research made it possible to determine the industrial profiles of regions (industrial, extractive, agricultural, and service) and to identify the sustainability (stable, unstable, fading, and nascent) of specialization in the regions of Kazakhstan. The information on the sustainability of specialization allows for choosing the priorities more accurately for allocating and developing new production sectors in regions of different types. Thus, innovations are most acceptable for industries with a stable specialization. But one should keep in mind the risk of changing technologies or black swans for the specialization of regions (Šidlauskaitė-Riazanova & Miškinis, 2019). Another risk is that employment elasticity in Kazakhstan is negatively associated with trade openness, inflation, and the exchange rate. (Bhat et al., 2022)

The strategy of innovative development can be applied to emerging specializations in the field of industry is a national priority due to knowledge intensiveness (Balland & Boschma, 2021; Iacobucci & Guzzini, 2016; Capello & Kroll, 2016). Unstable and fading specializations deserve an additional study of the factors of instability and extinction before determining the strategy for developing the industry. However, one should consider that location quotients are not robust to adding one "hypothetical" establishment in very small towns, and with population sizes of about 4,100 or more people, they are reasonably stable (Pominova, 2021). Moreover, some researchers found that economic specialization is inconsistently associated with higher gross value added with positive but statistically insignificant effects (Dzemydaitė, 2021).

The study made it possible to determine the typology of regions by the level of diversification of the manufacturing industry in the regions: regions with high diversification of the manufacturing industry, regions with a medium level and a low level of diversification of the manufacturing industry. This factor should also be considered when developing regional industrial and innovative policies.

Thus, the obtained range of research results allows the development of a strategy and measures to increase the competitiveness of the country's regions, which can have a fruitful impact on the socioeconomic development of the territories and the level of well-being of their population.

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