



Socioeconomic Differentiation in Labour Resource Development across the Regions of Kazakhstan

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ABSTRACT

The development of labour resources is one of the key factors in the socio-economic development of regions, while significant territorial differences in demographic and labour characteristics necessitate their comprehensive assessment. The aim of the study is to assess the level of development of labour resources in the regions of Kazakhstan and to identify interregional differences in their formation and use based on an integrated approach. The information base of the study consists of official regional statistical data from the Republic of Kazakhstan for 2014–2024, including indicators of population size, migration, unemployment, youth unemployment, self-employment, employment, the number of hired workers, the labour force, and the employment rate. The study uses Z-standardization of indicators and calculates integral indices for three blocks: demographic development, the labour market and social stability, employment and labour activity. The results revealed persistent interregional differences that require the implementation of differentiated policies. The group with a high level of labor resource development includes the city of Almaty, with a total integral index value of 1.010606; the Turkestan Region, with 0.841212; the Almaty Region, with 0.823939; and the city of Astana, with 0.490303. The lowest values of the overall integral index were recorded in the Ulytau Region (–0.666667) and the North Kazakhstan Region (–0.544550). The obtained results confirm the significant territorial differentiation in the formation and use of labor resources in Kazakhstan and can be used in developing differentiated measures of social and regional policy in the labor market.

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Қазақстан өңірлерінің еңбек ресурстарын дамытудың әлеуметтік-экономикалық саралануы

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ТҮЙІН

Еңбек ресурстарының дамуы өңірлердің әлеуметтік-экономикалық дамуының негізгі факторларының бірі болып табылады, бұл ретте демографиялық және еңбек сипаттамаларындағы елеулі аумақтық айырмашылықтар оларды кешенді бағалау қажеттілігін негіздейді. Зерттеудің мақсаты интегралдық тәсіл негізінде Қазақстан өңірлеріндегі еңбек ресурстарының даму деңгейін бағалау және олардың қалыптасуы мен пайдаланылуындағы өңіраралық айырмашылықтарды анықтау болып табылады. Зерттеудің ақпараттық базасын Қазақстан Республикасының 2014–2024 жылдардағы ресми өңірлік статистикалық деректері құрады, олар халық саны, көші-қон, жұмыссыздық, жастар жұмыссыздығы, өзін-өзі жұмыспен қамту, жұмыспен қамту, жалдамалы жұмыскерлер саны, жұмыс күші және жұмыспен қамту деңгейі көрсеткіштерін қамтиды. Зерттеуде көрсеткіштерді Z-стандарттау, үш блок бойынша интегралдық индекстерді есептеу әдістері қолданылды: демографиялық даму, еңбек нарығы және әлеуметтік тұрақтылық, жұмыспен қамту және еңбек белсенділігі. Нәтижелер сараланған саясатты енгізуді талап ететін тұрақты өңіраралық айырмашылықтарды анықтады. Еңбек ресурстарының даму деңгейі жоғары топқа жалпы интегралдық индекс мәні 1.010606 болған Алматы қ., 0.841212 болған Түркістан облысы, 0.823939 болған Алматы облысы және 0.490303 болған Астана қ. жатқызылды. Жалпы интегралдық индекстің ең төмен мәндері Ұлытау облысында (–0.666667) және Солтүстік Қазақстан облысында (–0.544550) тіркелді. Алынған нәтижелер Қазақстанның еңбек ресурстарын қалыптастыру мен пайдаланудағы елеулі аумақтық саралануды растайды және еңбек нарығындағы әлеуметтік және өңірлік саясаттың сараланған шараларын әзірлеу кезінде пайдаланылуы мүмкін.

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жұмыспен қамту;
жұмыссыздық; еңбек нарығы; көші-қон;
әлеуметтік мобильділік;
әлеуметтік тұрақтылық;
өңірлік даму; өңірлік саясат

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Социально-экономическая дифференциация развития трудовых ресурсов регионов Казахстана

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АННОТАЦИЯ

Развитие трудовых ресурсов является одним из ключевых факторов социально-экономического развития регионов, при этом значительные территориальные различия в демографических и трудовых характеристиках обуславливают необходимость их комплексной оценки. Цель исследования заключается в оценке уровня развития трудовых ресурсов регионов Казахстана и выявлении межрегиональных различий в их формировании и использовании на основе интегрального подхода. Информационную базу исследования составили официальные региональные статистические данные Республики Казахстан за 2014–2024 гг., включающие показатели численности населения, миграции, безработицы, молодежной безработицы, самозанятости, занятости, численности наемных работников, рабочей силы и уровня занятости. В исследовании применены Z-стандартизация показателей, расчет интегральных индексов по трем блокам — демографическое развитие, рынок труда и социальная стабильность, занятость и трудовая активность. Результаты выявили устойчивые межрегиональные различия, которые требуют внедрения дифференцированной политики. К группе с высоким уровнем развития трудовых ресурсов отнесены г. Алматы со значением общего интегрального индекса 1.010606, Туркестанская область - 0.841212, Алматинская область – 0.823939 и г. Астана – 0.490303. Наиболее низкие значения общего интегрального индекса зафиксированы в Улытауской области (–0.666667) и Северо-Казахстанской области (–0.544550). Полученные результаты подтверждают значительную территориальную дифференциацию формирования и использования трудовых ресурсов Казахстана и могут быть использованы при разработке дифференцированных мер социальной и региональной политики на рынке труда.

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1. Introduction

Labour resources determine economic productivity, territorial competitiveness, and the potential for long-term economic growth and regional development. For Kazakhstan, this issue is particularly pressing because of regional heterogeneity in socioeconomic development. The country's regions vary significantly in human capital development, educational potential, quality of life, and employment conditions (Nyussupova et al., 2022; Unerbayeva et al., 2025). At the same time, structural changes are underway. Employment is being redistributed across economic sectors, while labour demand is also changing. Increasing interregional differentiation makes the effective formation and utilisation of labour resources particularly important (Bolatova et al., 2025).

The demographic basis of labour supply is determined by the size of the working-age population and its participation in the labour force. The World Bank defines the labour force as the population aged 15 years and older who provide labour to produce goods and services, including both employed and unemployed individuals (World Bank, 2024). According to the ILO, employment refers to working-age individuals performing work for pay or profit. At the same time, the labour force participation rate measures the share of the working-age population that is actively participating in the labour market (ILO, 2024). Therefore, labour force utilisation can be defined as the actual participation of the population in economic activity.

Human resource development has a well-established international conceptual basis. The ILO links human resource development with vocational guidance and training aimed at developing and utilising human capabilities for work. This framework also encompasses education, initial and continuing training, and lifelong learning (ILO, 2024). In Kazakhstan, the labour market is characterised by differences in employment and unemployment and by changes in the structure of employment across economic sectors and occupational groups. A mismatch between employers' demand for personnel and the professional competencies of the labour force also remains an important labour market issue (Izguttiyeva et al., 2022). Research on regional development also shows that Kazakhstan's regions vary significantly in their socioeconomic, demographic, and human resource characteristics. Differences in demographic resources and human capital are important factors in territorial differentiation; therefore, assessing regional development requires consideration of the specific characteristics of each region (Uskelenova & Nikiforova, 2024).

Despite the existing body of research, a comprehensive assessment of regional differences in the formation and utilisation of labour resources remains necessary. Regional policy largely depends on the timely identification of territorial disparities and appropriate measures to reduce them. The proposed approach differs from previous studies by integrating multiple dimensions of labour resource development into a single assessment framework. Demographic development, labour market and migration conditions, and employment and labour force characteristics are first assessed separately through standardised block-specific integral indices and then combined into an overall integral index. PCA is also applied to examine the structure of regional differences within each indicator block. This approach allows both the overall level of labour resource development and differences in regional indicator profiles to be assessed. The aim of the study is to assess the level of development of labour resources in the regions of Kazakhstan and to identify interregional differences in their formation and use based on an integrated approach.

2. Literature review

The quality of labour force formation and its effective use largely determine regional development, as they ensure the creation of human capital, increased labour productivity, innovation, and sustainable economic growth. Most studies agree that labour force development is a key factor in the long-term competitiveness of territories. For example, Silin and Tkacheva (2015) showed that regional development depends on the size of the economically active population and the qualitative characteristics of human resources. The effectiveness of territorial development directly depends on the quality of human resources and the conditions under which they are formed, and investments in human development are becoming a prerequisite for sustainable socioeconomic development. From a regional economic perspective, Naydenov (2019) develops a similar conclusion, but emphasises human resources as a strategic factor in regional competitiveness. The author views human resource development as an investment in human capital that ensures territories' long-term economic growth. Moreover, human resources determine a region's ability to adapt to structural economic changes and maintain sustainable development. Fedulova et al. (2019) and Belyakova et al. (2021) noted that the efficiency of labour resource utilisation influences the sustainable development of a region's economy. Kouskoura et al. (2024) considered labour resource development a fundamental component of regional competitiveness. Human capital and the quality of the labour force are among the defining components of regional competitiveness. Consequently, assessing the level of labour resource development is important for analysing regional development and formulating effective public policy. Thus, labour resources are a fundamental factor in regional development.

Regional differences in labour force development are shaped by economic, demographic, institutional, and spatial factors. Some studies explain regional differences in labour force development by differences in economic activity, the structure of regional economies, migration processes, and regions' ability to attract and retain skilled labour. Migration increases regional differences in the distribution of human capital and the concentration of skilled labour in economically developed regions, while simultaneously reducing the labour potential of peripheral territories (Williams, 2009). This results in greater spatial differentiation in the labour market, with the most developed regions gaining additional competitive advantages from the influx of labour. Beyond migration, the spatial concentration of economic activity significantly shapes regional differences. The formation of industry clusters contributes to the development of a specialised labour market, increased employment, higher incomes, and enhanced regional competitiveness (Spencer et al., 2010). The development of clusters, in turn, leads to increased spatial labour mobility. Workers' decisions to change jobs depend on wage levels, job quality, infrastructure development, and regional career opportunities (Ganesch, 2018). As a result, labour resources are redistributed to regions with more favourable employment conditions, exacerbating regional differences in human capital endowments and labour efficiency.

Differences in the quality and utilisation of human resources largely determine the level of regional development (Jašková & Havierníková, 2020). The level of human development directly affects the economic resilience and competitiveness of regions, necessitating a comprehensive assessment of the labour force. Moreover, the impact of labour mobility varies across regions. Identical mechanisms for labour resource redistribution can yield different outcomes depending on the region's level of socioeconomic development. Large agglomerations benefit significantly from labour mobility thanks to sectoral diversification of the economy and intensive redistribution

of workers between enterprises, while peripheral regions experience significantly less benefit from similar processes (Kuusk, 2021). The combination of factors examined ultimately determines the characteristics of regional labour supply and demand. Aji and Akbardin (2024) demonstrated that the state of the regional labour market is shaped by demographic processes, the population's educational level, technological change, economic structure, and the wage system. Thus, research demonstrates that a complex set of interrelated factors shapes regional differences in labour force development. A comprehensive analysis of regional disparities is necessary to assess the level of labour force development and develop effective regional policies.

To assess the formation and use of labor resources, studies use various indicator groups that reflect labor market characteristics. The choice of indicators depends on the study's objectives. Still, most authors consider labour market indicators the basis for assessing the socioeconomic development of territories and the quality of human capital. Some of the most common indicators include migration, employment structure, and labour reallocation across economic sectors. Wang et al. (2011) assess labour market development by the scale of internal migration, the levels of self-employment and employment in the agricultural and non-agricultural sectors, as well as the redistribution of labour resources between them. A decrease in self-employment leads to increased labour mobility and higher employment in more productive sectors of the economy. Changes in the employment structure make it possible to assess the effectiveness of labour force formation and use in the context of economic transformation.

Another important indicator is the unemployment rate, which is widely used in assessing the state of the regional labour market. Sahnoun and Abdennadher (2018) considered unemployment a key indicator of labour market efficiency and the effectiveness of public employment policy. The authors demonstrated that unemployment dynamics allow us to assess not only the state of the labour market but also the effectiveness of the institutional conditions for employment generation. Elezaj et al. (2019) proposed assessing the effectiveness of public policy in the labour market through the employment rate. Moreover, employment indicators allow us to assess the degree of population involvement in economic activity and the effectiveness of government measures. Karpushkina et al. (2021) and Andabayeva et al. (2024) proposed a more comprehensive approach. The authors note that the use of individual indicators does not permit a comprehensive assessment of the level of labour force development. They consider a combination of indicators of employment, unemployment, labour productivity, informal employment, employment structure, economic activity, sectoral changes, and labour market transformation as an assessment system. The integrated use of various indicators enables an objective assessment of labour force formation and utilisation processes, as well as the identification of existing socioeconomic differences between regions.

Despite the wide range of indicators used, most studies analyse them within the framework of specific aspects of labour market functioning. This necessitates a comprehensive assessment that integrates demographic characteristics, labour market indicators, and employment into a single, integrated system for assessing regional development.

The review revealed that existing studies primarily examine specific aspects of labour resource formation and utilisation or assess individual instruments of labour market regulation. Therefore, there is a need for an integrated assessment of labour resource formation and utilisation at the regional level. Simonova et al. (2018) proposed an index method for assessing regional labour potential, based on the premise that labour potential is a multicomponent system that cannot be

adequately described by a single indicator. Skrzek-Lubasińska and Gródek-Szostak (2020) demonstrated that individual employment indicators can serve as stand-alone measures characterising different aspects of labour market functioning and can be organised into separate analytical blocks. Vasylytsiv et al. (2023) confirmed that composite indices enable a more comprehensive assessment of labour potential development and facilitate interregional comparisons of labour markets. Widayanti (2026) noted that composite indices based on indicator normalisation and aggregation provide a comprehensive assessment of multidimensional phenomena and enable objective interregional comparisons. The present study adopts this approach to assess the formation and utilisation of labour resources across Kazakhstan's regions using three indicator blocks: demographic development, labour market and social stability, and employment and labour force participation.

3. Research methods

The study used official regional statistical data for Kazakhstan for 2014–2024 obtained from the Bureau of National Statistics of the Republic of Kazakhstan. Data on total population, urban and rural population, population aged 15–29, and migration were obtained from the Demographic Statistics database, while data on unemployment, youth unemployment, self-employment, employment, employees, the labour force, and the employment rate were obtained from the Employment and Unemployment Statistics database (Bureau of National Statistics, 2025). The selected indicators were grouped into three blocks reflecting key dimensions of regional labour resource development (Table 1).

Table 1. Indicator blocks for assessing regional labour resource development.

Indicator block	Indicator	Unit of measurement
Demographic development block	Total population	Persons
	Urban population	Persons
	Rural population	Persons
	Population aged 15–29 years	Persons
	Unemployed population aged 15 years and older	Persons
Labour market and social stability block	Unemployment rate	Percentage
	Youth unemployment rate aged 15–24	Percentage
	Self-employed workers	Persons
	Total migration balance	Persons
	Employed population	Persons
Employment and labour activity block	Employees	Persons
	Labour force	Persons
	Employment rate of the population aged 15 years and older	Percentage

Note: compiled by the authors based on data from the Bureau of National Statistics (2025).

In 2022, Kazakhstan changed its administrative-territorial structure. As a result, the Abay, Ulytau, and Zhetysu regions were formed. Therefore, the availability of statistical data for these regions varies by indicator and observation period. Data for the Abay, Ulytau, and Zhetysu regions in the first block were available for the entire study period (2014–2024). However, for the second and third blocks, data are available only from 2022 onward.

To standardise the data, Z-score standardisation was applied, followed by the construction of integral indices for the three indicator blocks. Standardisation ensured the comparability of

indicators measured on different scales. The indicators were calculated separately for each year to accurately reflect interregional differences in the context of changes in Kazakhstan's administrative-territorial structure in 2018 and 2022. The following formula was used for standardization (1):

$$Z_{ijt} = \frac{X_{ijt} - \mu_{jt}}{\sigma_{jt}} \quad (1)$$

where:

Z_{ijt} – the standardized value of indicator j for region i in year t ;

X_{ijt} – the value of indicator j for region i in year t ;

μ_{jt} – the average value of indicator j across regions in year t ;

σ_{jt} – the standard deviation of indicator j for regions in year t .

For indicators in the second block that characterise adverse socioeconomic phenomena, the standardised values were inverted. The inversion was applied to the unemployed population, unemployment rate, and youth unemployment rate. Higher unemployment indicates less favourable labour market conditions; therefore, without inversion, higher values of these indicators would increase the integral index. To ensure a consistent direction of influence across all indicators, the standardised values of the negative indicators were inverted so that higher unemployment values reduced the resulting index. The inversion was performed according to formula (2):

$$Z_{ijt}^* = -Z_{ijt} \quad (2)$$

After standardising the indicators and inverting negative variables, integral indices were calculated for each block. The calculation of the integral index was performed as an arithmetic mean of the standardised values of the indicators within the corresponding block according to the formula (3):

$$Index_{it} = \frac{\sum_{j=1}^n Z_{ijt}}{n} \quad (3)$$

where:

$Index_{it}$ – integral index of region i in year t ;

Z_{ijt} – the standardised value of indicator j region i in year t ;

n – the number of indicators in the block;

$j = 1, \dots, n$ – individual indicators included in the corresponding block.

In this study, all indicators within each block were assigned equal weights when constructing the integral indices. This approach ensured that each indicator contributed equally to the corresponding block index and avoided assigning subjective importance to individual indicators. The resulting integral indices were subsequently used to analyse interregional differences and classify Kazakhstan's regions according to their level of labour resource development.

The results of Z-standardisation show the extent to which regional indicators deviate from the national average. Z-score values indicate the relative position of each region for a given indicator. Positive values indicate levels above the national average, while negative values indicate levels below the national average. Values close to zero indicate that the corresponding indicator is close

to the national average. A larger absolute Z-score indicates a greater deviation from the average. Z-standardisation enables comparisons across regions regardless of differences in the scales of the original indicators.

After calculating the three block-specific integral indices, an overall regional labour resource development index was constructed. The overall index was calculated as the arithmetic mean of the three integral indices representing demographic development, labour market and social stability, and employment and labour activity (4):

$$OverallIndex_{it} = \frac{Index_{it}^{B1} + Index_{it}^{B2} + Index_{it}^{B3}}{3} \quad (4)$$

where:

$OverallIndex_{it}$ – overall labour resource development index for region i in year t ;

$Index_{it}^{B1}$ – integral index of demographic development for region i in year t ;

$Index_{it}^{B2}$ – integral index of labour market and social stability for region i in year t ;

$Index_{it}^{B3}$ – integral index of employment and labour activity for region i in year t .

The overall integral index was used to assess the overall level of labour resource development across Kazakhstan's regions. Based on the obtained values, the regions were classified into three groups (high, medium, and low) according to their level of labour resource development.

PCA and the integral indices were used for different analytical purposes. The integral indices were constructed by standardising and aggregating the selected indicators to assess overall levels. PCA examined the structure of variation and similarities among regional indicator profiles. Therefore, the position of a region in the principal component space was not interpreted as its level or rank according to the integral index (OECD/European Union/EC-JRC, 2008).

4. Results

To assess the demographic component of workforce development, in this paper calculated an integral index based on standardized values of the corresponding indicators. The values reflect each region's relative position compared with Kazakhstan's average level in the corresponding year. Table 2 shows the results of calculating the integral index of demographic development for the regions of Kazakhstan for 2014-2024.

Table 2. Integral demographic development index for 2014-2024.

Region	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Abay	-0.48	-0.49	-0.50	-0.52	-0.54	-0.56	-0.57	-0.58	-0.66	-0.67	-0.67
Akmola	-0.34	-0.35	-0.34	-0.38	-0.38	-0.39	-0.40	-0.41	-0.37	-0.38	-0.38
Aktobe	-0.10	-0.10	-0.11	-0.11	-0.12	-0.12	-0.13	-0.14	-0.15	-0.16	-0.16
Almaty	0.71	0.71	0.70	0.71	0.73	0.74	0.73	0.73	0.79	0.80	0.81
Atyrau	-0.63	-0.62	-0.60	-0.58	-0.57	-0.55	-0.54	-0.52	-0.50	-0.49	-0.48
West Kazakhstan	-0.53	-0.53	-0.53	-0.53	-0.53	-0.53	-0.53	-0.53	-0.53	-0.53	-0.53
Zhambyl	0.38	0.38	0.37	0.34	0.32	0.32	0.32	0.32	0.37	0.35	0.34
Zhetysu	-0.50	-0.50	-0.50	-0.51	-0.52	-0.53	-0.53	-0.53	-0.50	-0.50	-0.50
Karaganda	0.50	0.49	0.45	0.41	0.37	0.33	0.29	0.26	0.15	0.12	0.09
Kostanay	-0.03	-0.05	-0.07	-0.10	-0.13	-0.15	-0.18	-0.21	-0.30	-0.32	-0.34
Kyzylorda	-0.29	-0.27	-0.27	-0.26	-0.26	-0.25	-0.24	-0.23	-0.26	-0.25	-0.25
Mangystau	-0.58	-0.56	-0.53	-0.51	-0.49	-0.47	-0.43	-0.40	-0.38	-0.35	-0.33

Pavlodar	-0.30	-0.31	-0.33	-0.35	-0.37	-0.39	-0.40	-0.42	-0.45	-0.46	-0.47
North Kazakhstan	-0.68	-0.70	-0.70	-0.72	-0.73	-0.74	-0.74	-0.74	-0.77	-0.77	-0.78
Turkistan	2.09	2.08	2.06	2.02	1.99	1.95	1.98	1.99	1.93	1.92	1.90
Ulytau	-1.35	-1.34	-1.32	-1.31	-1.30	-1.29	-1.27	-1.26	-1.26	-1.24	-1.22
East Kazakhstan	-0.34	-0.36	-0.38	-0.40	-0.42	-0.44	-0.46	-0.48	-0.51	-0.52	-0.53
Astana city	0.27	0.29	0.27	0.45	0.52	0.55	0.60	0.63	0.76	0.80	0.85
Almaty city	1.95	1.96	2.01	2.02	2.02	2.03	2.01	2.00	2.05	2.06	2.06
Shymkent city	0.16	0.18	0.20	0.22	0.26	0.37	0.37	0.39	0.45	0.46	0.46

Note: compiled by the authors.

The integral demographic development index revealed persistent interregional differences in population concentration, urban and rural population, and the population aged 15–29 years. Turkistan region and Almaty city recorded the highest values throughout the study period. In Turkistan region, the integral index decreased from 2.09 in 2014 to 1.90 in 2024; however, the region maintained the highest values for demographic development. This was mainly associated with its large total and rural populations and high share of young people. In Almaty city, the integral index remained consistently high, increasing from 1.95 in 2014 to 2.06 in 2024. These high values were primarily associated with the concentration of urban population and young people.

The indicator also increased considerably in Astana and Shymkent. In Astana, it increased from 0.27 in 2014 to 0.85 in 2024. In Shymkent, it increased from 0.16 to 0.46. The indicator also showed high positive values in the Almaty and Zhambyl regions. In the Almaty region, the integral indicator increased from 0.71 to 0.81. In the Zhambyl region, values remained at 0.32–0.38 throughout the observation period. In the Karaganda region, by contrast, the integral indicator decreased gradually from 0.50 in 2014 to 0.09 in 2024. The lowest values at the end of the period were observed in the Ulytau (-1.22), North Kazakhstan (-0.78), and Abay regions (-0.67). In the North Kazakhstan region, the integral index decreased gradually over the period. In the Ulytau region, values remained below -1.2 throughout the period. Negative values were also observed in East Kazakhstan (-0.53), West Kazakhstan (-0.53), Pavlodar (-0.47), and Zhetysu (-0.50).

Table 3 presents the integral labour market and migration index across Kazakhstan's regions for 2014–2024.

Table 3. Integral labour market and social stability index for 2014–2024.

Region	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Abay	-	-	-	-	-	-	-	-	0.04	0.14	0.10
Akmola	0.18	0.24	0.13	0.38	0.27	0.24	0.18	0.07	0.19	-0.07	-0.06
Aktobe	0.24	0.01	0.26	0.28	0.13	-0.12	0.12	0.32	-0.15	0.09	-0.07
Almaty	0.19	0.11	0.20	0.33	0.10	0.09	0.01	0.10	0.26	0.18	0.22
Atyrau	0.36	0.45	0.32	0.37	0.34	0.34	0.33	0.27	0.42	0.15	-0.02
West Kazakhstan	0.12	0.11	0.14	0.07	0.04	0.05	-0.10	-0.05	-0.17	-0.22	-0.33
Zhambyl	0.08	-0.10	-0.01	0.08	0.08	0.08	0.13	0.03	-0.06	0.04	-0.10
Zhetysu	-	-	-	-	-	-	-	-	-0.36	-0.24	-0.12
Karaganda	-0.19	-0.89	-0.71	-0.67	-0.51	-0.37	-0.21	-0.12	-0.05	0.32	0.03
Kostanay	0.07	0.18	0.13	0.23	0.22	0.21	0.13	0.15	0.07	0.10	0.01
Kyzylorda	-0.14	-0.10	-0.09	-0.10	-0.01	-0.15	-0.07	-0.17	-0.18	-0.34	-0.37
Mangystau	-0.15	-0.13	-0.30	-0.08	0.13	-0.04	0.00	-0.11	-0.18	-0.48	-0.57
Pavlodar	0.37	0.35	0.22	0.10	0.06	0.18	0.26	0.18	0.17	0.05	0.05
North Kazakhstan	-0.10	0.04	-0.18	-0.07	-0.07	-0.01	-0.51	-0.17	-0.30	-0.38	-0.03
Turkistan	-0.54	-0.49	-0.09	-0.51	-0.31	0.01	-0.13	-0.20	-0.11	0.14	0.32
Ulytau	-	-	-	-	-	-	-	-	0.34	0.44	0.55

East Kazakhstan	0.20	0.09	0.20	0.18	0.01	-0.08	0.07	0.15	-0.07	-0.13	-0.18
Astana city	-0.26	-0.07	0.72	0.44	0.35	0.54	0.50	0.53	0.38	0.40	0.58
Almaty city	-0.57	-0.15	-0.90	-0.88	-0.80	-0.60	-0.52	-0.85	-0.44	-0.38	-0.34
Shymkent city	0.36	0.55	0.12	0.13	0.17	-0.09	0.10	0.12	0.21	0.20	0.33

Note: compiled by the authors.

The indicators of block unemployment, self-employment, and migration showed more pronounced interregional differences than the demographic block. Regional differences were linked to unemployment levels, population migration, and structural employment. The highest values at the beginning of the period were observed in Atyrau, Pavlodar, and Shymkent regions, as well as in Akmola region. In the Atyrau region, the indicator rose from 0.36 in 2014 to 0.45 in 2015, then gradually declined to -0.02 by 2024. In the Pavlodar region, values in 2014–2015 were 0.35–0.37, but by the end of the period they fell to 0.05.

The integral indicator grew in Astana city and Turkestan. In Astana city, the indicator increased from -0.26 in 2014 to 0.58 in 2024. The highest values were observed in 2016–2021, when the indicator exceeded 0.5. In Turkestan, the indicator was negative at the start of the period, but by 2024 it had increased to 0.32. In Ulytau, for which values are available from 2022, the integral indicator increased from 0.34 in 2022 to 0.55 in 2024.

Most of the period showed negative values in Almaty, Kyzylorda, and Mangystau regions. The lowest value in Almaty was -0.90 in 2016. By 2024, the indicator rose to -0.34, but remained negative throughout the period. In the Kyzylorda region, the indicator fell to -0.37 by the end of the period. In the Mangystau region, after 2018, the integral indicator gradually deteriorated, and in 2024 it fell to -0.57. In Karaganda region in 2015–2017, the lowest values of the integral indicator were observed, including -0.89 in 2015. By the end of the period, the indicator had increased to 0.03. In the North Kazakhstan region, the lowest value was observed in 2020 (-0.51); however, by 2024, the indicator increased to -0.03.

In 2022–2024, Astana city, Turkestan, and Ulytau recorded relatively high values. Meanwhile, in the Mangistau and Kyzylorda regions, indicators decreased toward the end of the period. Regional differences in migration, unemployment, and the employment structure remained throughout the period.

Table 4 presents the integral employment and labour force index across Kazakhstan's regions for 2014–2024.

Table 4. Employment and labour activity index for 2014–2024.

Region	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Abay	-	-	-	-	-	-	-	-	-0.82	-0.65	-0.63
Akmola	0.11	-0.05	0.00	0.00	-0.03	-0.07	-0.11	-0.17	0.19	0.00	-0.08
Aktobe	-0.27	-0.36	-0.34	-0.33	-0.23	-0.30	-0.26	-0.27	0.01	0.12	0.35
Almaty	1.81	1.66	1.89	1.89	1.89	1.78	1.70	1.63	1.05	0.95	0.99
Atyrau	-0.33	-0.19	-0.27	-0.21	-0.23	-0.14	-0.14	-0.20	0.05	0.17	0.26
West Kazakhstan	-0.78	-0.91	-0.75	-0.75	-0.75	-0.76	-0.66	-0.67	-0.44	-0.37	-0.34
Zhambyl	0.15	-0.19	-0.21	-0.08	-0.03	-0.08	-0.04	-0.08	0.28	0.30	0.25
Zhetysu	-	-	-	-	-	-	-	-	-0.53	-0.64	-0.83
Karaganda	0.43	0.42	0.24	0.21	0.25	0.23	0.21	0.22	0.14	0.13	0.21
Kostanay	0.03	-0.02	0.07	0.10	0.05	-0.01	-0.11	-0.04	0.17	0.18	0.03
Kyzylorda	-0.86	-0.98	-0.95	-0.93	-0.89	-0.95	-0.99	-1.01	-0.82	-0.80	-0.76
Mangystau	-1.17	-0.65	-0.75	-0.84	-0.39	-0.49	-0.47	-0.20	-0.02	-0.05	-0.04
Pavlodar	-0.03	-0.23	-0.30	-0.33	-0.35	-0.40	-0.37	-0.41	-0.16	-0.13	-0.12

North Kazakhstan	-0.62	-0.60	-0.75	-0.83	-0.76	-0.80	-0.76	-0.78	-0.70	-0.73	-0.79
Turkistan	1.00	0.76	0.74	0.70	0.71	0.67	0.66	0.64	0.64	0.59	0.65
Ulytau	-	-	-	-	-	-	-	-	-0.95	-1.27	-1.39
East Kazakhstan	0.39	0.23	0.26	0.29	0.28	0.30	0.29	0.30	-0.44	-0.34	-0.36
Astana city	0.07	0.45	0.39	0.35	0.22	0.56	0.57	0.55	0.92	1.03	0.97
Almaty city	0.83	1.22	1.29	1.32	1.42	1.51	1.64	1.69	2.15	2.25	2.29
Shymkent city	-0.75	-0.56	-0.55	-0.56	-0.92	-0.83	-0.85	-0.88	-0.74	-0.74	-0.64

Note: compiled by the authors.

The integral indicator of employment and labour force showed stable interregional differences in the level of population involvement in economic activity. The highest values throughout the entire period were observed in Almaty city, Almaty and Turkistan regions.

In Almaty city integrated index increased from 0.83 in 2014 to 2.29 in 2024. The most noticeable growth was observed after 2018. High values were driven by the growth of the employed population, the labour force, and wage workers. In the Almaty region, the indicator remained at a high level throughout the period, despite a gradual decline from 1.81 in 2014 to 0.99 in 2024. In the Turkistan region, values decreased from 1.00 to 0.65, but the region maintained positive values throughout the observation period. By the end of the study period, the lowest value of the integrated indicator was observed in Ulytau Oblast (-1.39). Low values were also observed in Zhetysu (-0.83), North Kazakhstan (-0.79), and Kyzylorda (-0.76) regions. In Ulytau Oblast, the indicator was -0.95 in 2022. By 2024, its value had decreased to -1.39. In North Kazakhstan and Kyzylorda Oblasts, negative values persisted throughout the study period. Negative values were also observed in the Shymkent, Mangistau, and West Kazakhstan regions. In Shymkent, indicators remained below -0.5 throughout the entire period. In the Mangystau region, after the lowest value of -1.17 in 2014, the indicator gradually increased to -0.04 by the end of the period. Differences in the level of employment, the labour force, and the structure of labour activity of the population persisted in the regions of Kazakhstan during the considered period. Thus, the results showed strong interregional differences in employment levels and the population's involvement in economic activity.

The results of integrated indicators for three blocks confirm the presence of interregional differences in demographic characteristics, labour market conditions, and the level of employment of the population in Kazakhstan. The highest overall index values were observed in Almaty city, Astana city, Almaty and Turkistan regions. At the same time, some regions maintain stable negative values for demographic and labour indicators throughout the entire observation period.

The first block showed the most stable regional structure. The highest values of the integrated demographic indicator were observed in the Turkistan region and Almaty. In Astana and Shymkent, the growth of the demographic potential and urban population was observed during the period. The lowest values were recorded in Ulytau, North Kazakhstan, and Abay regions. In the second block, differences in unemployment, migration, and self-employment within the population were more pronounced. In some regions, a gradual improvement in integral indicators was observed, while in others, by the end of the period, values deteriorated. The most complicated situation was observed in Kyzylorda and Mangystau regions. Positive dynamics were observed in Astana, Turkistan and Ulytau regions. The third block showed differences between regions in employment levels, labour force, and the population's involvement in labour activity. The highest values were observed in Almaty, the Almaty region, and Astana. At the same time, negative values

of the integral indicator were preserved in Shymkent, Ulytau, North Kazakhstan and Kyzylorda regions.

Turkestan region and Shymkent require special attention. After the administrative division of regions, some statistical indicators were published separately only in 2018. Despite this, both regions maintained high demographic indicators. At the same time, employment and unemployment indicators indicated a more tense labour market, especially in Shymkent.

For Abay, Ulytau and Zhetysu regions, some statistical data began to be published separately only from 2022 due to changes in the administrative-territorial structure of Kazakhstan. In the first block, integral indicators were available for the entire observation period, whereas in the second and third blocks, the time series for individual indicators began in 2022. Despite this, noticeable differences between regions have already been observed. In the Ulytau region, the lowest values were recorded for several demographic and labour indicators. In the Abay region, stable negative values of the demographic block were observed. In the Zhetysu region, the integral indicators of employment and the labour force decreased at the end of the period.

Principal component analysis (PCA) was conducted to reveal the spatial structure of regional differences and to assess the similarity of dynamic socio-demographic and labor processes. The analysis was performed separately for each integral block: demographic development, indicators of unemployment and migration, and indicators of employment and the labour force. The use of PCA enabled determining the degree of differences among Kazakhstan's regions, identifying the closest and most distant groups of regions, and assessing the stability of the regional structure of indicators for 2014–2024.

Figure 1 shows the results of a PCA analysis of integrated demographic indicators for Kazakhstan's regions for 2014–2024.

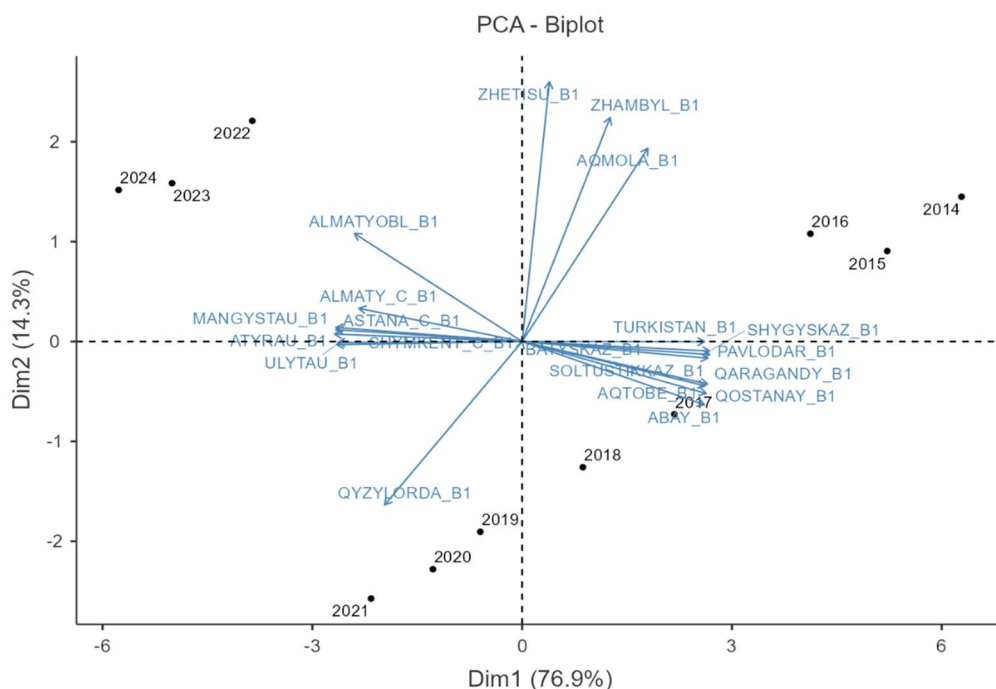


Figure 1. PCA Biplot of demographic development indicators.

The first principal component explains 76.9% of the total variance, and the second - 14.3%. Both components explained more than 90% of the data variation, indicating the model's high informativeness. Turkestan, Almaty city, and Almaty were positioned separately from most other regions along the first principal component. Zhambyl and Zhetysu regions occupied a separate position in the second component. Ulytau, Mangistau, Atyrau and Kyzylorda regions were located in the negative part of the first component. Their position indicates differences in demographic profiles rather than a lower level of demographic development. Pavlodar, Karaganda, Kostanay, and East Kazakhstan regions showed similar demographic characteristics. Astana and Shymkent occupied an intermediate position in the principal component space, relatively close to the centre of the PCA biplot. Their position indicates a less pronounced differentiation in their demographic profiles than in regions farther from the centre.

Figure 2 presents the results of a PCA analysis of the integral indicators of unemployment, self-employment, and migration for the regions of Kazakhstan.

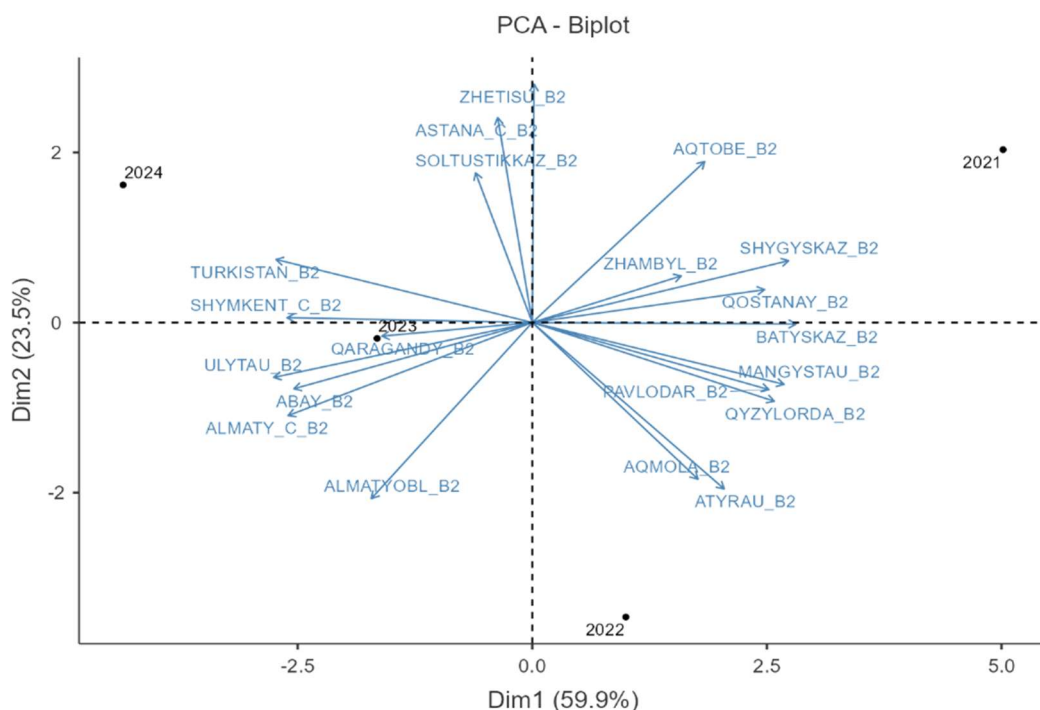


Figure 2. PCA Biplot of labour market and social stability indicators.

The first main component explains 59.9% of the total variance, and the second - 23.5%. Together, the two components explain 83.4% of the total variance. Shymkent and Almaty city were positioned in the negative part of the first component. Astana also occupied a separate position; however, it was located in the positive part of the second component. Turkestan, Karaganda, Ulytau and Abay regions were in the negative part of the first component. Pavlodar, North Kazakhstan and Atyrau regions were located in the positive part of the first component, while their positions along the second component differed. Zhambyl also occupied a distinct position along the second component. Most of the regions were clustered near each other in the central part of the graph, indicating relatively similar profiles across the labour market and migration indicators included in

the analysis. Turkestan, Almaty region, Atyrau and Akmola were more clearly separated from the central group of regions in the principal component space.

Figure 3 shows the results of the PCA analysis of integral indicators of employment and labour force in the regions of Kazakhstan for 2014-2024.

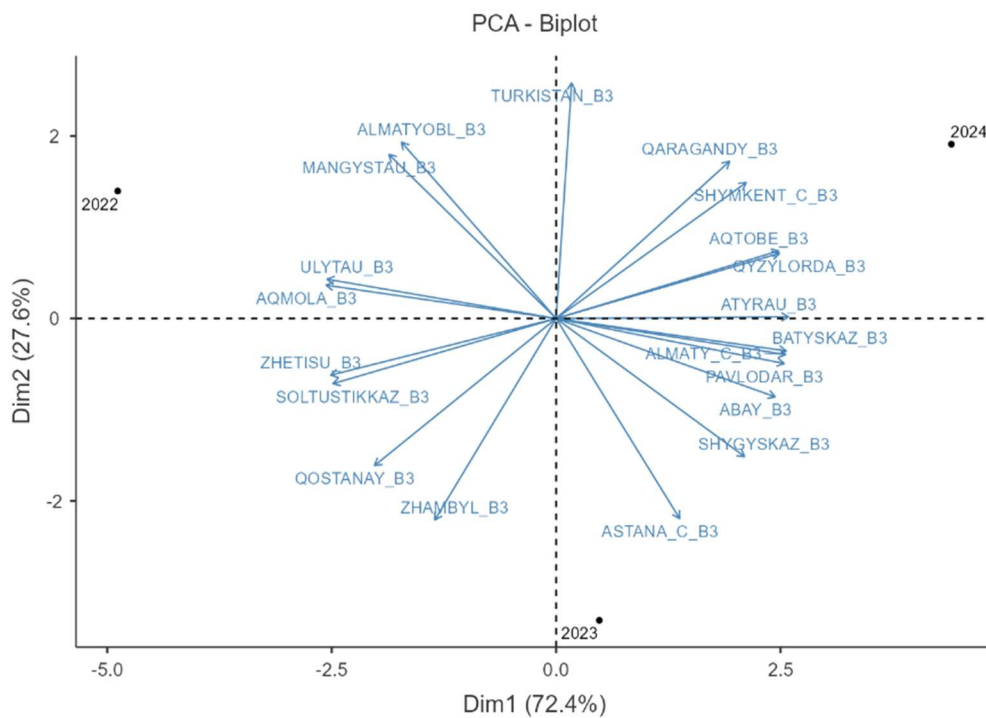


Figure 3. PCA Biplot of employment and labour activity indicators.

The first main component explains 72.4% of the total variance, and the second explains 27.6%. Together, the two components explain 100% of the variation in the data. Almaty region, Mangystau, Ulytau, Akmola, Zhetysu, North Kazakhstan, Kostanay and Zhambyl were located in the negative part of the first component. Astana city, East Kazakhstan, Abay, Kyzylorda, West Kazakhstan, Atyrau, Aktobe, Shymkent and Karaganda were located in the positive part of the first component. Turkestan was positioned close to the centre of the first component and had the highest positive position along the second component. Astana city and Zhambyl were distinguished by their negative positions along the second component. Almaty region and Mangystau were positioned in the positive part of the second component. The distribution of regions showed differences in employment structures, the labour force, and population involvement in economic activity.

The PCA results and the integral indices provide different information on regional differences. A region's position in PCA space reflects its indicator profile. The principal components show the main dimensions of variation across regions and do not represent the overall level of labour resource development. Therefore, the distinct positions of Mangystau, Atyrau, and West Kazakhstan in the PCA results do not contradict the integral index values observed for Almaty, Astana and Almaty cities.

Based on three integrated indices characterizing demographic development, labor market conditions, and employment levels, an overall integrated index of labor force development for

Kazakhstan's regions was calculated. The index reflects the overall level of labour force development and allows for a comprehensive comparison of regions over the period 2014–2024 (Table 5).

Table 5. Overall integral labor resource development index for 2014–2024.

Region	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Abay	–	–	–	–	–	–	–	–	-0.48	-0.39	-0.40
Almaty	0.90	0.83	0.93	0.98	0.91	0.87	0.81	0.82	0.70	0.64	0.67
Almaty city	0.74	1.01	0.80	0.82	0.88	0.98	1.04	0.95	1.25	1.31	1.34
Akmola	-0.02	-0.05	-0.07	0.00	-0.05	-0.07	-0.11	-0.17	0.00	-0.15	-0.17
Aktobe	-0.04	-0.15	-0.06	-0.05	-0.07	-0.18	-0.09	-0.03	-0.10	0.02	0.04
Astana city	0.03	0.22	0.46	0.41	0.36	0.55	0.56	0.57	0.69	0.74	0.80
Atyrau	-0.20	-0.12	-0.18	-0.14	-0.15	-0.12	-0.12	-0.15	-0.01	-0.06	-0.08
West Kazakhstan	-0.40	-0.44	-0.38	-0.40	-0.41	-0.41	-0.43	-0.42	-0.38	-0.37	-0.40
Mangystau	-0.63	-0.45	-0.53	-0.48	-0.25	-0.33	-0.30	-0.24	-0.19	-0.29	-0.31
Pavlodar	0.01	-0.06	-0.14	-0.19	-0.22	-0.20	-0.17	-0.22	-0.15	-0.18	-0.18
Karaganda	0.25	0.01	-0.01	-0.02	0.04	0.06	0.10	0.12	0.08	0.19	0.11
Kostanay	0.02	0.04	0.04	0.08	0.05	0.02	-0.05	-0.03	-0.02	-0.01	-0.10
Kyzylorda	-0.43	-0.45	-0.44	-0.43	-0.39	-0.45	-0.43	-0.47	-0.42	-0.46	-0.46
East Kazakhstan	0.08	-0.01	0.03	0.02	-0.04	-0.07	-0.03	-0.01	-0.34	-0.33	-0.36
Shymkent city	-0.08	0.06	-0.08	-0.07	-0.16	-0.18	-0.13	-0.12	-0.03	-0.03	0.05
North Kazakhstan	-0.47	-0.42	-0.54	-0.54	-0.52	-0.52	-0.67	-0.56	-0.59	-0.63	-0.53
Turkistan	0.85	0.78	0.90	0.74	0.80	0.88	0.84	0.81	0.82	0.88	0.96
Ulytau	–	–	–	–	–	–	–	–	-0.62	-0.69	-0.69
Zhambyl	0.20	0.03	0.05	0.11	0.12	0.11	0.14	0.09	0.20	0.23	0.16
Zhetysay	–	–	–	–	–	–	–	–	-0.46	-0.46	-0.48

Note: compiled by the authors.

The results of calculating the overall integrated index confirmed persistent interregional differences in labour force development in Kazakhstan. The highest values throughout the period under review were observed in the city of Almaty, the Turkistan and Almaty regions, and the city of Astana. These regions were characterised by favourable demographics, a high labour force concentration, and a relatively high employment rate. The lowest index values over most of the period were observed in North Kazakhstan, Kyzylorda, West Kazakhstan, and Mangystau. In 2022–2024, Ulytau, Abay, and Zhetysay also recorded low values.

The regions were divided into three groups based on their overall integrated index values: high (index ≥ 0.40), medium (0.00–0.39), and low (index < 0.00) (Table 6).

Table 6. Classification of Kazakhstan's regions by the overall labour resource development index.

Region	Overall index	Group
Almaty city	1.010606	High
Turkistan	0.841212	High
Almaty	0.823939	High
Astana city	0.490303	High
Zhambyl	0.131212	Medium
Karaganda	0.084242	Medium
Kostanay	0.002121	Medium
Aktobe	-0.065760	Low
Shymkent city	-0.069700	Low

Akmola	-0.078180	Low
East Kazakhstan	-0.096970	Low
Atyrau	-0.120610	Low
Pavlodar	-0.154240	Low
Mangystau	-0.363940	Low
West Kazakhstan	-0.404550	Low
Abay	-0.424444	Low
Kyzylorda	-0.439090	Low
Zhetysu	-0.468889	Low
North Kazakhstan	-0.544550	Low
Ulytau	-0.666667	Low

Note: compiled by the authors.

6. Conclusions

The study made it possible to assess the level of development of the labor resources in the regions of Kazakhstan and to identify persistent interregional differences in their formation and use. The use of an integrated approach ensured a comprehensive consideration of demographic characteristics, the state of the labor market and social stability, as well as indicators of employment and labor activity of the population. The results obtained confirmed that the regions of Kazakhstan differ significantly both in terms of individual components of labor resource development and in the value of the overall integrated index.

The group with a high level of labor resource development includes the city of Almaty, the Turkestan and Almaty regions, as well as the city of Astana. The average level is characteristic of the Zhambyl, Karaganda, and Kostanay regions. The remaining regions were grouped into the low-level category, with the lowest values of the overall integral index recorded in the Ulytau and North Kazakhstan regions. This differentiation reflects differences in demographic potential, employment levels, the state of the labor market, and the degree of population engagement in economic activity.

The results of the principal component analysis supplemented the integral assessment and revealed differences in the structure of regional characteristics. At the same time, the region's position in the space of principal components reflects the characteristics of its profile and is not a direct indicator of the level of development of labour resources. The combined use of integral indices and PCA made it possible to examine interregional differences both from the perspective of the overall level of development and from the point of view of the structure of indicators.

The results obtained can be used in developing differentiated measures of social and regional policy in the field of employment and labour market development. For regions with low values of the integral index, measures aimed at increasing employment, developing labour potential, improving the conditions for the functioning of regional labour markets, and reducing persistent territorial imbalances are of particular importance.

The limitations of the study are related to the availability of regional statistical data. For the Abay, Ulytau, and Zhetisu regions, some indicators are available only from 2022, which limits the comparability of the time series. In addition, the integral index reflects only the indicators included in the formed blocks and does not cover all possible aspects of labor resource development. In the future, the study may be expanded by including additional social and economic indicators and extending the observation period..

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