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HUMAN CAPITAL MOBILITY AND MIGRATION'S IMPACT ON ECONOMIC AND TECHNOLOGICAL PROGRESS

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ABSTRACT

Human Capital Mobility and Migration's Impact on Economic and Technological Progress

This study analyzes how migration and other factors affect employment and unemployment in Kazakhstan and Kyrgyzstan using statistical methods and finds that economic and educational opportunities attract migrants, thereby increasing labor market competition. In Kazakhstan, unemployment is influenced by new arrivals and higher education graduates (positive) and by GDP per capita (negative); employment is influenced by R&D spending and GDP (positive), as well as by new arrivals (negative). In Kyrgyzstan, higher education graduates reduce unemployment, while arrivals and graduates of secondary vocational institutions boost employment. Migration negatively affects employment in Kazakhstan and positively affects it in Kyrgyzstan, informing future migration policy decisions.

KEYWORDS: unemployment, employment, emigrants, immigrants, education, natural population growth

IZVLEČEK

Vpliv mobilnosti človeškega kapitala in migracij na gospodarski in tehnološki napredek

Avtorji so v študiji z uporabo statističnih metod analizirali, kako migracije in drugi dejavniki vplivajo na zaposlenost in brezposelnost v Kazahstanu in Kirgizistanu. Ugotovili so, da gospodarske in izobraževalne priložnosti privabljajo migrante,

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kar povečuje konkurenco na trgu dela. V Kazahstanu na brezposelnost vplivajo novi priseljenci in diplomanti visokošolskega izobraževanja (pozitivno) ter BDP na prebivalca (negativno), medtem ko na zaposlenost vplivajo izdatki za raziskave in razvoj ter BDP (pozitivno) in novi prihodi (negativno). V Kirgizistanu visokošolski diplomanti zmanjšujejo brezposelnost, medtem ko diplomanti srednjih poklicnih šol in novi priseljenci povečujejo zaposlenost. V Kazahstanu migracije na zaposlenost vplivajo negativno, v Kirgizistanu pa pozitivno, kar je pomembno za prihodnje odločitve o migracijski politiki.

KLJUČNE BESEDE: brezposelnost, zaposlenost, izseljenci, priseljenci, izobraževanje, naravna rast prebivalstva

INTRODUCTION

Migration influences national labor markets in various ways, including compensating for labor shortages, altering wage structures, and contributing to employment shifts. In highly technical industries, migration can be beneficial when qualified specialists are in short supply. Migration can contribute to economic growth by attracting entrepreneurs from other countries, increasing tax revenues, and increasing demand for domestic products and services. At the same time, migration can increase competition in the national labor market: the local population is at risk of losing their jobs if migrants agree to work for lower wages. The state may lose tax revenues due to irregular migration; the inadequate integration of migrants often leads to conflicts over cultural, religious, and other differences or to their social isolation. The departure of young, qualified professionals abroad causes brain drain, reducing the country's economic development potential.

In 2014–2023, the migration balance in the Republic of Kazakhstan and the Republic of Kyrgyzstan was mostly negative (Zhumashbekova et al., 2024), indicating that out-migration exceeded in-migration in both countries. In 2022–2023, however, the situation began to change rapidly. Therefore, it is relevant and important to assess and analyze sharp changes in migration trends and the labor market's response to them, as large-scale in-migration can have different causes and consequences for national economies.

According to Jussibaliyeva et al. (2022), the out-migration of young people seeking employment abroad is a key socioeconomic problem in the Republic of Kazakhstan. At the same time, the researchers acknowledge that youth migration can have positive consequences, including increased knowledge of young people and greater opportunities for self-realization. The main negative consequence of youth migration is that it often becomes permanent or non-returnable; that is, young people do not return to their homeland and remain permanently in other countries. According to scientists, the main factors behind this situation are economic, demographic, and social.

Iskakova et al. (2023) found that migration negatively affects the Republic of Kazakhstan's labor market and economic activity, including real wages and unemployment. In contrast to these findings, Zhumashbekova et al. (2024) found that modern migration in the Republic of Kazakhstan as a host country has a positive impact on labor market development and increases welfare. The researchers noted that the Republic of Kazakhstan's policy aimed at preventing the negative consequences of migration processes has effective solutions.

Sabihanova (2024) studied the internal migration in the Republic of Kazakhstan, concluding that it substantially shapes demographic models and influences labor-market dynamics. The main factors influencing internal migration trends in the Republic of Kazakhstan are government policy, economic opportunities, and demographic trends. Among the ways to address the existing problems related to migrant integration, the researcher noted the need to ensure inclusiveness and to implement an integrated approach that considers migrants' needs. Arbashiyeva & Spanov (2022) noted that both internal and external migration are important for ensuring the country's demographic and economic security. The authors analyzed migration trends by region, emphasizing significant differences in terms of migration balance. This prompts the search for effective solutions to address those differences, especially in regions with a significant out-migration.

Askarova et al. (2025) studied migration processes in the Republic of Kyrgyzstan. According to the researchers, an important problem with migration is that, in several countries, it is addressed through political means. A significant gap between the labor and education markets is the primary driver of out-migration in the Republic of Kyrgyzstan. Isabekov et al. (2025) reached similar conclusions, adding that the level of professional training of migrants from the Republic of Kyrgyzstan in the modern international labor market remains mostly low. The researchers emphasized problems in the field of education, in particular, low attendance and overcrowding in schools, an imbalance in vocational education, and insufficient professional training for teaching staff. Critelli et al. (2021) and Dzhooshtbekova et al. (2021) noted that migration trends in the Republic of Kyrgyzstan have been significantly affected by crises, including large-scale unemployment, impoverishment, and the country's rapid social stratification following the collapse of the Union of Soviet Socialist Republics.

Despite numerous studies examining the economic, social, and demographic factors of migration, there remains a lack of comprehensive analysis of how the regional characteristics of migration processes affect labor-market dynamics in Kazakhstan and Kyrgyzstan. The relationships among internal and external migration, employment and unemployment rates, and the role of investment in education, innovation, and infrastructure in mitigating or exacerbating the effects of migration patterns have not been sufficiently studied. The long-term effects of migration on human capital development, innovation potential, and technological progress in

these countries have been studied to a limited extent, leaving a significant gap for further research.

The research hypothesis is that migration processes have a significant impact on the labor market in Kazakhstan and Kyrgyzstan. In the short term, an increase in in-migration raises both competition within the working-age population and the unemployment rate. At the same time, it creates potential for economic growth and technological development by strengthening human capital, investment, and innovation.

The study aimed to analyze the impact of migration on the number of unemployed and employed people in the Republic of Kazakhstan and the Republic of Kyrgyzstan. The following tasks were set: to conduct a statistical analysis of the dynamics of unemployment, employment, and migration trends in the Republic of Kazakhstan and the Republic of Kyrgyzstan; to analyze the relationship between migration and labor market trends using correlation analysis; to analyze the impact of migration on employment and unemployment in the Republic of Kazakhstan and the Republic of Kyrgyzstan using regression analysis.

MATERIALS AND METHODS

The statistical analysis conducted was based on data from official statistical sources of the Republic of Kazakhstan and the Republic of Kyrgyzstan (Bureau of National Statistics, 2025; National Statistical Committee of the Kyrgyz Republic, 2025). This analysis enabled the examination of trends in the studied indicators and their structure, as well as a comparison of the data by region. The analysis included the following indicators:

- the number of arrivals and the number of departures to the Republic of Kazakhstan and the Republic of Kyrgyzstan for the period from 2014 to 2023;
- migration balance in the Republic of Kazakhstan and the Republic of Kyrgyzstan for the period from 2014 to 2023;
- migration balance of the Republic of Kazakhstan by region in 2023 and migration balance of the Republic of Kyrgyzstan by region in 2024;
- the number of employed and unemployed populations in the Republic of Kazakhstan and the Republic of Kyrgyzstan for the period from 2014 to 2023;
- the number of unemployed populations by region in the Republic of Kazakhstan in the fourth quarter of 2024 and the Republic of Kyrgyzstan in 2024.

The correlation analysis identified linear relationships between the variables and their standardizations and highlighted variables for further regression analysis. The total sample of variables includes the following indicators (Table 1).

Metric	Measurement unit
For the Republic of Kazakhstan	
Number of unemployed people	persons
Employment level	persons
Balance of external migration	persons
Number of arrivals to the Republic of Kazakhstan	persons
Number of people who left the Republic of Kazakhstan	persons
Gross domestic product per capita	USD
Graduates of higher education institutions	persons
Self-employed workers	persons
Natural population growth	persons
GDP growth	%
Consumer price index	-
Number of young people	persons
Foreign direct investment	% GDP
Graduates of technical, vocational, and secondary education institutions	persons
Total fertility rate	-
Number of recipients of designated state social assistance	persons
Domestic research and development (R&D) expenditures in the following areas	KZT (Kazakhstani Tenge)
Share of organizations using computers	%
Share of organizations with access to the internet	%
Share of organizations with Internet resources	%
R&D expenditures, total	KZT
For the Republic of Kyrgyzstan	
Number of unemployed people	persons
Employment level	persons
Migration growth	persons
Number of arrivals	persons
Number of leavers	persons
Gross domestic product per capita	USD
Graduates of higher education institutions	persons
Graduates of secondary (complete) education (11th grade)	persons
Graduates of secondary vocational education institutions	persons
Consumer price index	-
Natural population growth	persons
Number of young people	persons

Total fertility rate	-
Foreign direct investment	% GDP
GDP growth	%
Hidden and informal economy	KGS (Kyrgyzstani Som)
Number of state aid recipients registered with social protection authorities	persons
Number of newly created jobs	persons
Salary	KGS
State budget expenditures on education	KGS
Number of enterprises and organizations using ICT	persons

Table 1: Selection of indicators for correlation analysis. Source: compiled by the authors based on the Bureau of National Statistics (2025), National Statistical Committee of the Kyrgyz Republic (2025).

Differences in the samples of indicators for the Republic of Kazakhstan and the Republic of Kyrgyzstan are due to the availability of up-to-date data from official sources. The regression analysis used indicators of the number of employed and unemployed people as dependent variables. The migration indicators and indicators (control variables) that had statistically significant relationships with the number of employed and unemployed people and did not demonstrate multicollinearity according to the Variance Inflation Factor (VIF) test were used as independent variables. The resulting models were tested for the normality of the residuals (Figures 1–4).

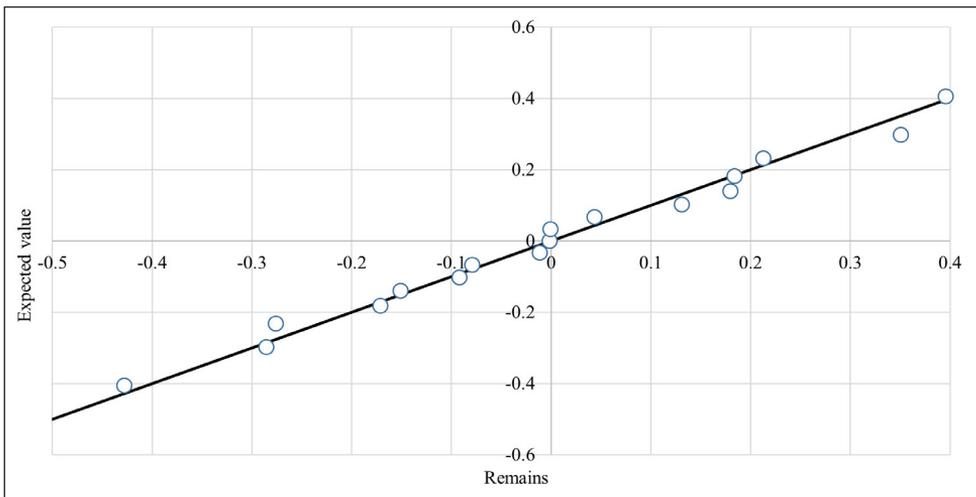


Figure 1: Graph of the normal distribution of residuals for the regression model explaining the number of unemployed people in the Republic of Kazakhstan. Source: compiled by the authors based on the Bureau of National Statistics (2025).

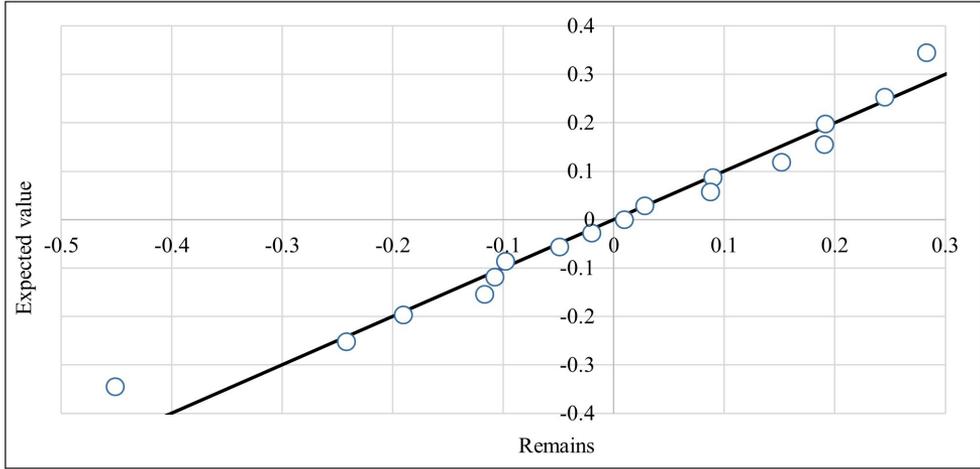


Figure 2: Normal distribution schedule of residuals for the regression model explaining the indicator of the employed population in the Republic of Kazakhstan. Source: compiled by the authors based on the Bureau of National Statistics (2025).

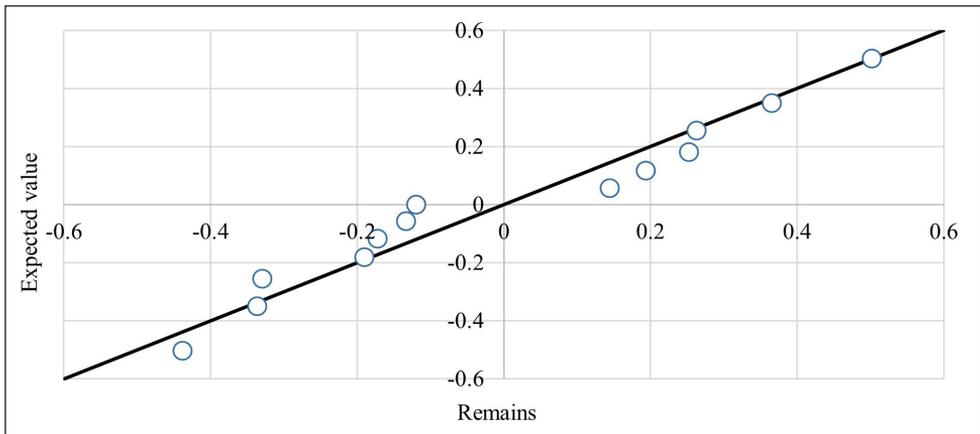


Figure 3: Normal distribution schedule of residuals for the regression model explaining the indicator of the unemployed population in the Republic of Kyrgyzstan. Source: compiled by the authors based on the National Statistical Committee of the Kyrgyz Republic (2025).

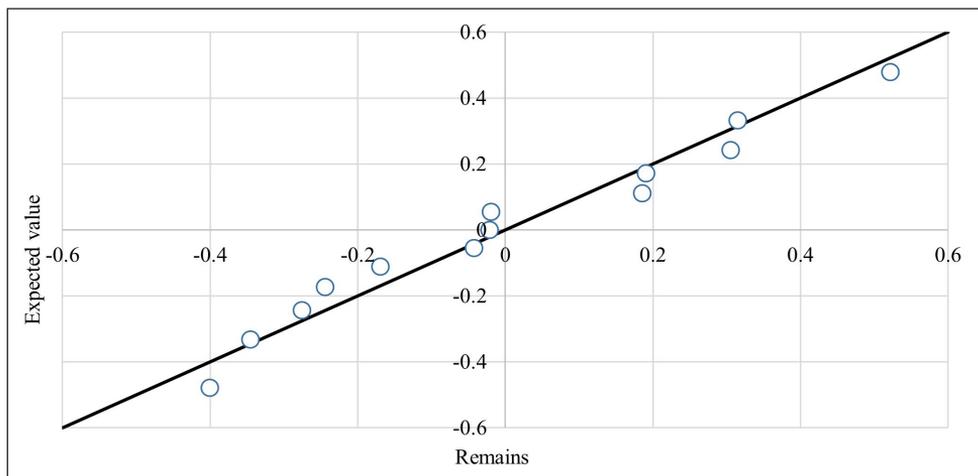


Figure 4: Normal distribution schedule of residuals for the regression model explaining the indicator of the employed population in the Republic of Kyrgyzstan. Source: compiled by the authors based on the National Statistical Committee of the Kyrgyz Republic (2025).

The regression analysis assessed the strength and direction of the impact of migration and other control variables, as well as key labor market indicators, in the countries studied. The obtained models are of high quality, as indicated by the t-test, F-test, and White's test. In addition, the models have a high explanatory power in terms of the determination coefficient R^2 .

RESULTS

Statistical analysis of migration and labor market trends in the Republic of Kazakhstan

Migration processes can significantly affect labor market trends, influencing both the supply of and demand for labor. In Kazakhstan, migration has contributed to regional disparities in employment opportunities, with urban areas seeing an increase in in-migration while rural areas experience out-migration. The following analysis presents key trends and correlations that help us understand these dynamics and their impact on employment patterns across the country.

The statistical analysis of migration and labor market trends yielded initial conclusions about relationships among key indicators and made assumptions based on the results. The statistical analysis covered the numbers of arrivals and departures, the migration balance, and the numbers of employed and unemployed people. The analysis of migration trends for the Republic of Kazakhstan is shown in Figure 5.

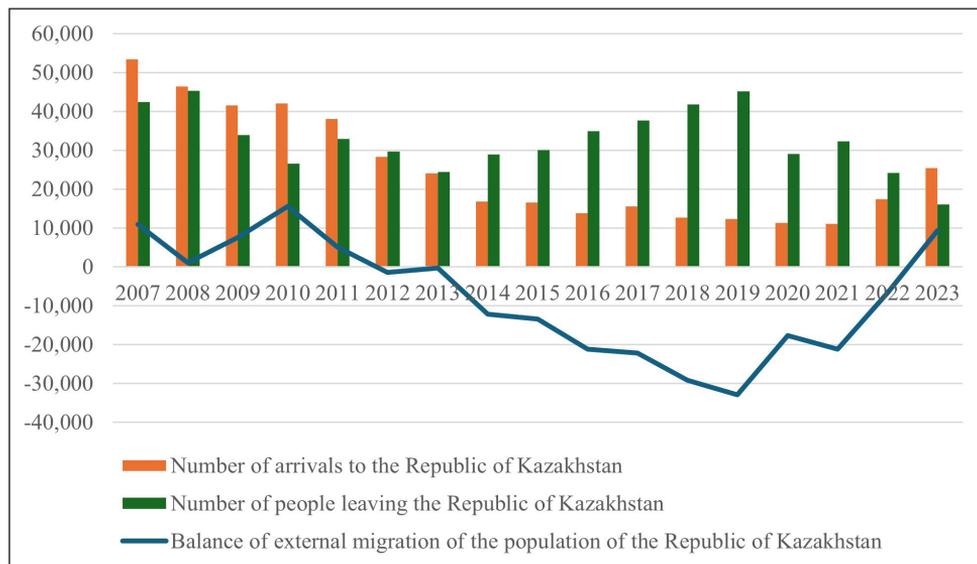


Figure 5: Trends in migration indicators in the Republic of Kazakhstan. Source: compiled by the authors based on the Bureau of National Statistics (2025).

The data in Figure 5 show that throughout the entire period under study, the Republic of Kazakhstan had a negative migration balance. In 2019, this indicator reached a maximum out-migration of $-45,225$ people, which can be attributed to the negative impact of socioeconomic factors: low wages, political factors, and a reduction in the number of skilled personnel. At the same time, the number of immigrants remained relatively stable, with 11,370 people arriving in the country in 2020, while 29,088 people left, almost three times as many. The migration balance became positive for the first time in ten years only in 2023, amounting to $+9,293$ people, which can be determined by a combination of factors: the migration impact of the war in Ukraine, the effect of support programs, the easing of quarantine restrictions, and the improvement of the economic climate in the country. Figure 6 shows that the Republic of Kazakhstan's migration balance demonstrated significant regional differences.

Large cities, in particular Almaty, Astana, and Shymkent, as well as regions with developed economies, such as Mangistau, Almaty, and Atyrau, have a positive migration balance. The negative migration balance is more typical in the northern and eastern regions, as well as in some central regions. The largest increase in migration is observed in the cities of Almaty and Astana, which are characterized by a high level of urbanization, driven by developed infrastructure, a stable labor market, and educational opportunities. High growth was observed in the Mangistau region, likely driven by the development of the oil industry, which has created new jobs. The Almaty and Atyrau regions also experienced a significant increase due to the active development of industry. Positive growth was typical in the southern centers of economic activity, Shymkent and the Turkestan region. Regions with a negative

migration balance could lose population due to economic stagnation, limited economic opportunities, lower wages, and underdeveloped social infrastructure.

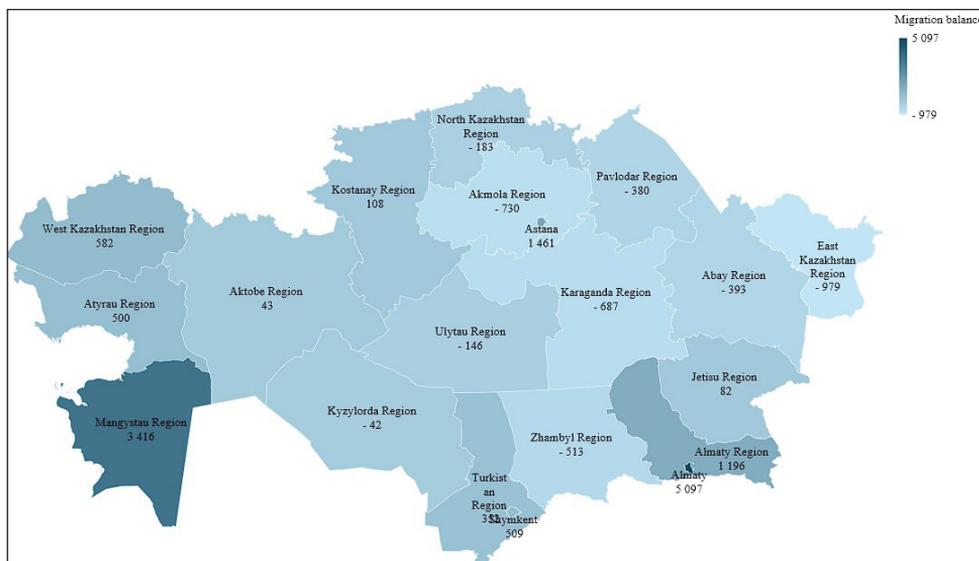


Figure 6: The migration balance of the Republic of Kazakhstan by regions in 2023, persons. Source: compiled by the authors based on the Bureau of National Statistics (2025).

Migration processes can significantly affect labor market trends. Figure 7 shows the trends and ratio of employed to unemployed population in the Republic of Kazakhstan.

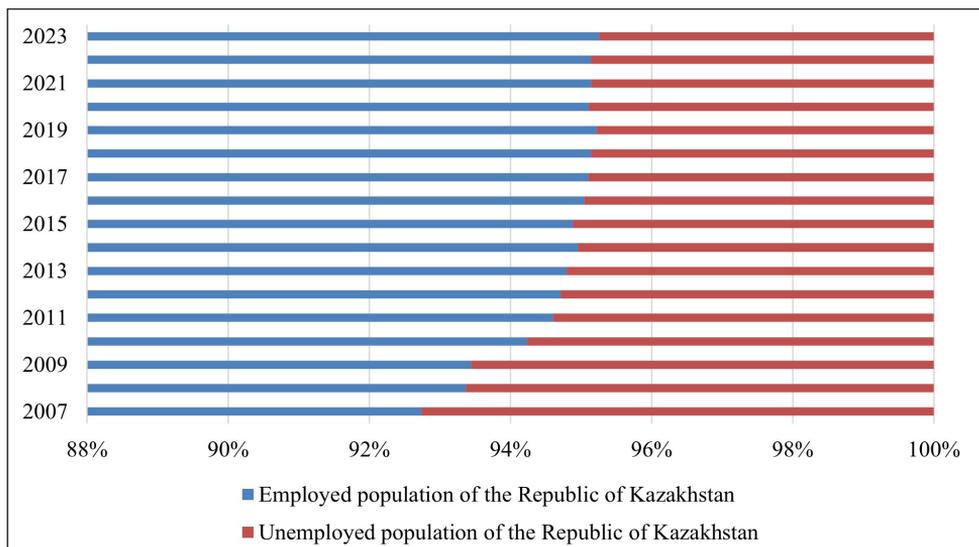


Figure 7: Number of employed to unemployed population in the Republic of Kazakhstan. Source: compiled by the authors based on the Bureau of National Statistics (2025).

Figure 7 shows a stable upward trend in the number of employed people in the Republic of Kazakhstan, suggesting economic growth, increased labor potential, and the creation of new jobs. For instance, while in 2016 the number of employed people was 8.55 million, in 2023 it increased to 9.08 million. After 2014, employment growth slowed slightly, which could be due to the decline in oil prices, the leading national export industry. The 2020 pandemic negatively impacted employment, with the number of unemployed people reaching 448,800 that year, putting significant pressure on the labor market. However, in 2021, a rapid recovery began, indicating that the situation has stabilized and economic activity has increased.

The trend in unemployment remains stable: the number of unemployed people in 2014 did not differ significantly from that in 2023. The number of unemployed people increased slightly in 2020 due to the pandemic, but the largest increase occurred in 2022. This may have been due to the country's political situation (mass protests) and significant in-migration, which may have increased competition in the labor market. In 2023, the Republic of Kazakhstan's labor market stabilized. Figure 8 shows the number of unemployed people in the Republic of Kazakhstan by region.

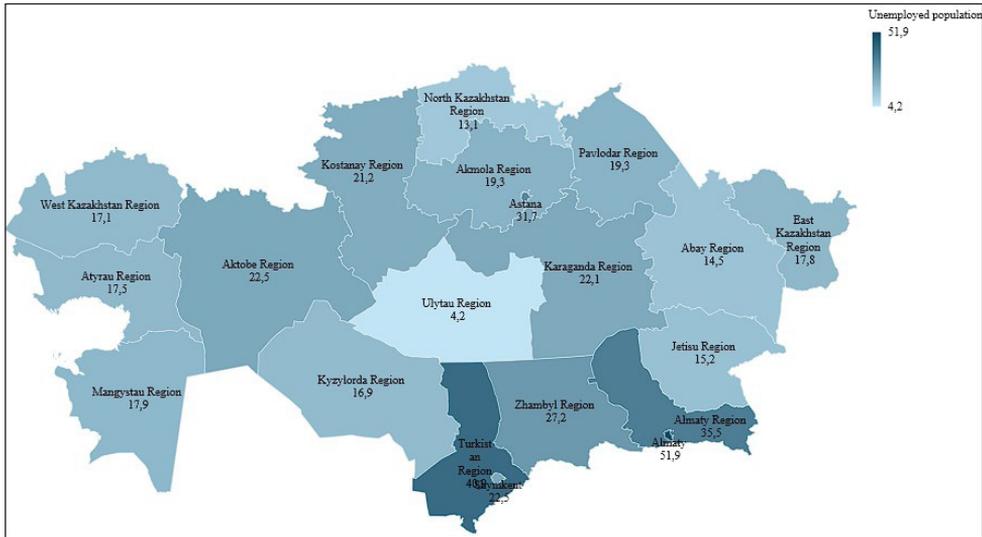


Figure 8: Number of unemployed populations in the Republic of Kazakhstan by region in the fourth quarter of 2024, by thousands of people. Source: compiled by the authors based on the Bureau of National Statistics (2025).

The unemployment rate in the Republic of Kazakhstan has marked regional differences. The largest numbers of unemployed people were observed in densely populated cities and agricultural regions. The high unemployment rates in the cities of Almaty and Astana, as well as in the Turkistan and Almaty regions, may be due to labor market competition and a significant share of the population employed in the informal sector. The significant number of unemployed people in the Zhambyl,

Aktobe, Karaganda, Kostanay, Pavlodar, and Akmola regions may be due to a lack of investment opportunities in these industrial regions. Low unemployment rates were typical in regions with smaller populations and regions with significant opportunities for self-employment (Utau, North Kazakhstan region, Zhetysuz region, Abay region). Linking these results to migration processes, it is possible to assume that the high unemployment rate in the most developed regions may result from internal migration to these regions.

An analysis of internal migration patterns in Kazakhstan and Kyrgyzstan, particularly the movement from rural areas to urban centers, provides a deeper understanding of the dynamics affecting regional labor markets beyond simple cross-border movement. In both countries, migration from rural to urban areas is a characteristic feature that reflects not only economic but also social processes associated with urbanization, industrialization, and the expansion of urban infrastructure.

In Kazakhstan, for example, the transition to an urban lifestyle is primarily driven by the search for better working and living conditions, as well as access to education and health services, which are often lacking in rural areas. Migration from rural regions, such as the southern and eastern regions, to large cities, such as Almaty, Astana, and Shymkent, is a major factor in labor market changes. Regional labor markets in cities actively absorb the workforce, but migrants often face high competition, especially for low-skilled jobs. This can lead to higher unemployment rates in urban centers, as local labor markets cannot always meet the demand for labor from new arrivals.

In Kyrgyzstan, internal migration is also closely linked to economic opportunities. Problems in agriculture, low incomes, and limited access to social services contribute to out-migration from rural areas to Bishkek, Osh, and other urban centers. Both economic and sociopolitical factors largely determine internal migration in Kyrgyzstan, as the transition to the city is part of the search for stability and security. Urban labor markets are not always able to absorb the large influx of rural migrants, which can create tension in the workforce, especially among young people.

These migrants face limited vocational training, insufficient access to formal employment, and a lack of housing opportunities; problems that often force them to seek work in the informal sector. The large number of people working in the informal economy reduces the level of social protection for these workers and creates additional challenges for public policy. Looking at these processes beyond simple cross-border movement allows for a deeper assessment of how internal migration patterns are changing the structure of regional labor markets, shaping not only economic stability but also the social and cultural aspects of urbanization. For the successful integration of migrants into urban labor markets, it is important to develop policies that support workforce education and retraining, foster the development of regional centers, and reduce social inequalities between urban and rural populations.

In many regions, informal employment constitutes a substantial share of economic activity, particularly in agriculture, small trade, construction, and services. While this sector often absorbs a significant portion of internal migrants and returning labor migrants, it is characterized by instability, lack of social protection, and limited opportunities for professional development. In Kazakhstan, high levels of informal employment in urban centers increase competition for low-skilled jobs and contribute to hidden unemployment, while in Kyrgyzstan, informal labor markets in rural areas serve as a coping mechanism for seasonal fluctuations and insufficient formal job creation. By not fully accounting for the informal economy, assessments of migration's impact on employment and unemployment risk overlooking structural vulnerabilities. Integrating this dimension into the analysis would clarify how migration interacts with hidden and unregulated forms of work, and how government policies could foster the gradual formalization of employment, improve working conditions, and strengthen social security systems.

Although the analysis demonstrates important links between migration and labor market outcomes, it also highlights the need for concrete policy responses. To mitigate the risk of rising unemployment linked to significant in-migration, governments could develop targeted employment programs, expand vocational training, and align education systems more closely with labor-market needs. Measures to stimulate regional development, such as infrastructure investment and incentives for enterprises in regions with high out-migration, could reduce imbalances across territories. Equally important are policies that foster migrants' integration into the formal labor market by recognizing qualifications, providing language support, and ensuring access to social protection. Such interventions would not only soften the short-term pressures of migration on employment but also transform human capital mobility into a long-term driver of innovation, productivity, and sustainable economic growth.

Statistical analysis of migration and labor market trends in the Republic of Kyrgyzstan

Kyrgyzstan has faced significant labor out-migration, particularly toward Kazakhstan and Russia, driven by economic instability and limited domestic employment opportunities. This out-migration has resulted in a loss of skilled labor. However, recent trends suggest a return migration driven by economic improvements and geopolitical factors, including the ongoing conflict in Ukraine. This contrasts with Kazakhstan, with more balanced migration, highlighting the differing economic and social factors influencing migration trends in Central Asia.

Comparing migration and labor market trends in Kazakhstan with those in Kyrgyzstan reveals specific differences and commonalities. Trends in migration rates in the Republic of Kyrgyzstan are shown in Figure 9.

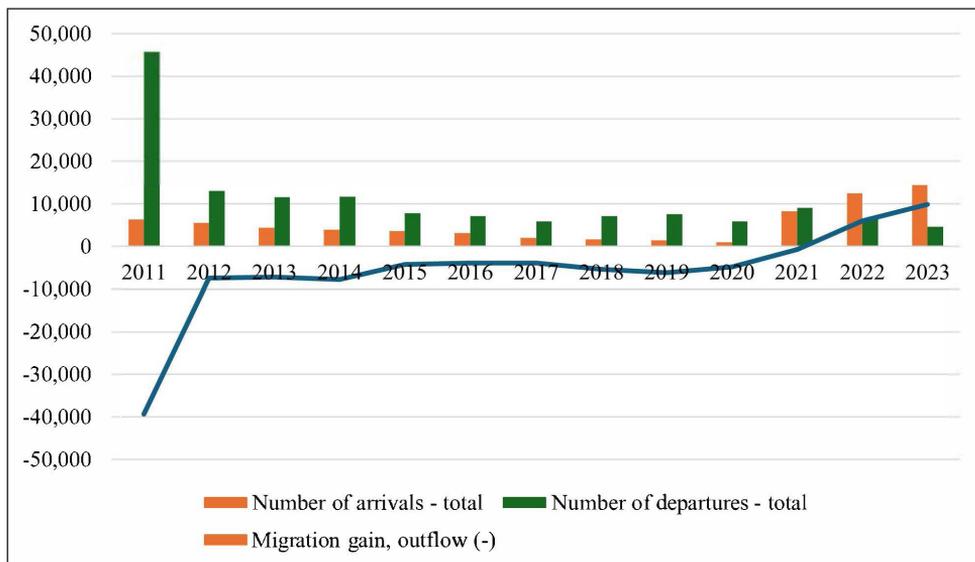


Figure 9: Trends in migration indicators in the Republic of Kyrgyzstan. Source: compiled by the authors based on the National Statistical Committee of the Kyrgyz Republic (2025).

From 2014 to 2020, the Republic of Kyrgyzstan experienced steady out-migration, which may have been driven by economic instability and insufficient wages, prompting the population to seek new opportunities abroad, including in the Republic of Kazakhstan. For example, in 2014, the migration balance was $-7,757$ people, and in 2018 it was $-5,390$ people, indicating significant emigration. However, in 2021, the situation changed dramatically: the number of arrivals (8,229 people) was almost equal to the number of departures (8,998 people), and the migration balance decreased to 769 people. After 2021, migration increased significantly: in 2023, the positive balance was 9,843 people. This could be due to improved economic conditions in the country, greater difficulties in departing for other countries, and an increase in migration driven by the war in Ukraine. Examining the situation by region of the Republic of Kyrgyzstan, it is possible to note that in 2024, all regions had a positive migration balance (Figure 10).



Figure 10: Migration balance of the Republic of Kyrgyzstan by region in 2024, persons. Source: compiled by the authors based on the National Statistical Committee of the Kyrgyz Republic (2025).

The largest increase in migration was characteristic of Osh and Jalal-Abad oblasts and the city of Bishkek. These regions are characterized by high population density and a developed agricultural sector. Bishkek, the capital city, offers broad economic and educational opportunities, creating a favorable environment for business development and attracting young people and qualified professionals. Moderate migration growth in some regions may indicate the development of industry and agriculture (Chui region) and tourism (Issyk-Kul region). Mountainous regions (Talas and Naryn) recorded the lowest growth, which can be attributed to lower investment in the regions and limited employment opportunities.

In the Republic of Kazakhstan and the Republic of Kyrgyzstan, migration is driven by a combination of push and pull factors. Among the push factors are limited employment opportunities in peripheral regions, wage disparities, political instability, corruption, and weak social protection systems, all of which compel individuals to seek better prospects abroad or in major urban centers. The pull factors include higher wages, better education and career opportunities, access to developed infrastructure, and political stability in receiving regions or countries. In Kazakhstan, the concentration of economic growth and investment in large urban centers such as Almaty and Astana creates strong internal pull effects, while out-migration from less developed northern and eastern regions reflects persistent structural imbalances. In Kyrgyzstan, large-scale labor migration is reinforced by insufficient domestic job creation, underfunded education and healthcare sectors, and high levels of social stratification. Furthermore, the political environment, including the effectiveness of

migration policies and bilateral agreements with host countries, plays a decisive role in shaping migration processes.

As in the Republic of Kazakhstan, migration trends in the Republic of Kyrgyzstan can be closely linked to employment and unemployment. Figure 11 shows the ratio and trend of the number of employed and unemployed people in the Republic of Kyrgyzstan.

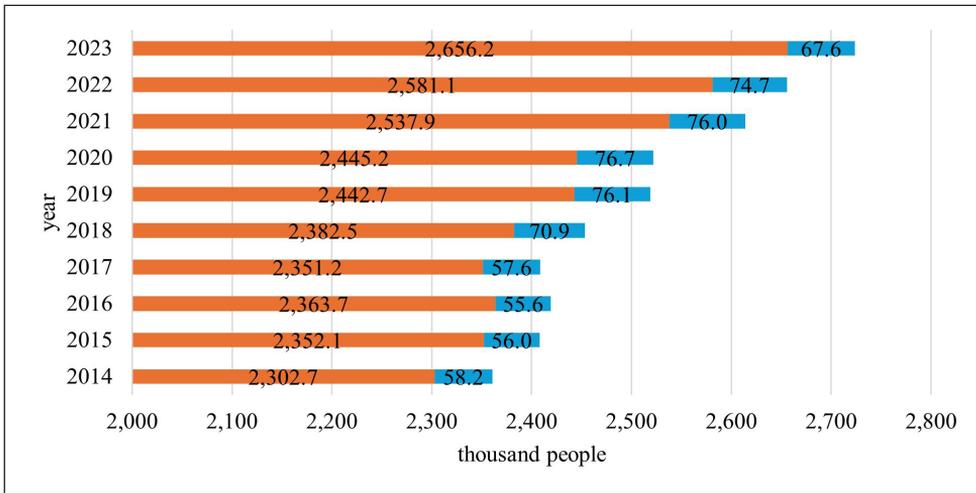


Figure 11: Number of employed and unemployed people in the Republic of Kyrgyzstan. Source: compiled by the authors based on the National Statistical Committee of the Kyrgyz Republic (2025).

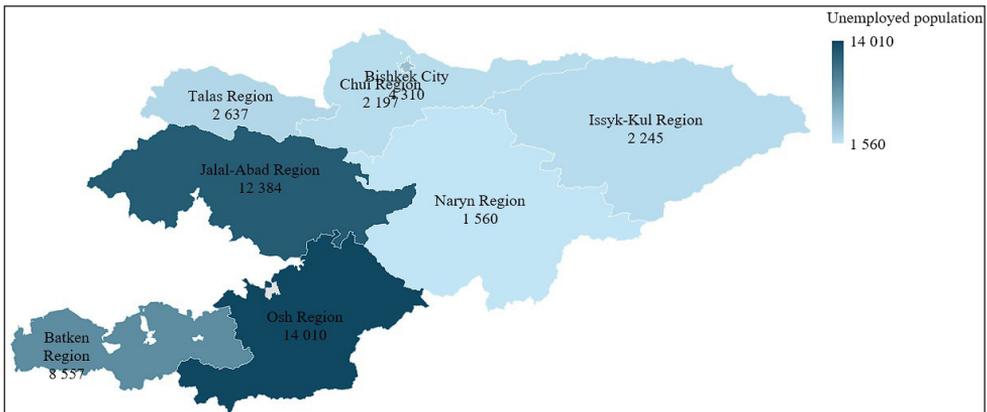


Figure 12: Unemployed population by region of the Republic of Kyrgyzstan in 2024, thousands of people. Source: compiled by the authors based on the National Statistical Committee of the Kyrgyz Republic (2025).

In the Republic of Kyrgyzstan, the number of employed persons has increased slowly but steadily from 2.3 million people in 2014 to 2.66 million people in 2023.

The number of unemployed increased from 58,000 in 2017 to 77,000 people in 2020, but since 2021, there has been a downward trend, reaching 67,600 in 2023. The pandemic had a minor impact on employment: the growth rate of employed people slowed markedly, and the number of unemployed people increased slightly. However, the following year, the labor market began to recover gradually, which may have been facilitated by a reduction in emigration during that period. Figure 12 shows the number of unemployed people in the Republic of Kyrgyzstan by region.

Figure 12 demonstrates that the unemployment rate exhibits significant regional disparities. The largest number of unemployed people is notable in densely populated regions. The Osh and Jalal-Abad regions have the highest unemployment rates, which could result from the return of labor migrants, as well as high unemployment in rural areas due to the seasonal nature of work. The city of Bishkek also faces unemployment, which can be attributed to the labor market competition. Other regions have much lower unemployment rates, which may be due to smaller populations and the availability of jobs in tourism and agriculture. Comparing migration trends and unemployment rates in the Republic of Kyrgyzstan, the results are consistent with the idea that regions with the highest net migration may also have the highest unemployment rate.

Correlation analysis between migration indicators and the labor market for the Republic of Kazakhstan

The statistical analysis indicated that migration and labor-market trends are correlated. An analysis of the correlations between key migration indicators and the number of unemployed and employed people should supplement these results. The correlation analysis also covers several additional variables, including macroeconomic, socioeconomic, and demographic indicators, as well as indicators of education and information and communication technologies (ICT). The high and statistically significant correlations between these indicators and labor market indicators provided the basis for their inclusion as control variables in the subsequent regression analysis. The results for the Republic of Kazakhstan are presented in Table 2.

	Unemployed population	Employed population
Balance of external migration	0.6636*	-0.5336*
Number of arrivals to the Republic of Kazakhstan	0.9058*	-0.8440*
Number of people who left the Republic of Kazakhstan	0.3406	-0.4754
Gross domestic product per capita	-0.5293*	0.5960*
Graduates of higher education institutions	0.7161*	-0.5704*

Self-employed workers	0.7023*	-0.7441*
Natural population growth	-0.9531*	0.8853*
GDP growth	0.3087	-0.2792
Consumer price index	0.3302	-0.1284
Number of young people	0.2262	-0.0797
Foreign direct investment	0.7458*	-0.7732*
Graduates of technical, vocational, and secondary education institutions	0.1679	-0.4100
Total fertility rate	-0.0927	-0.2126
Number of recipients of designated state social assistance	-0.5208*	0.8155*
Internal R&D expenditure from the regions	-0.5860*	0.8576*
Share of organizations using computers	-0.0007	0.2796
Share of organizations with access to the internet	-0.5272*	0.7486*
Share of organizations with Internet resources	-0.5790*	0.5824*
R&D expenditures	-0.5948*	0.8405*

Table 2: Results of correlation analysis between migration indicators and the labor market for the Republic of Kazakhstan (note: * = statistically significant correlations). Source: compiled by the authors based on the Bureau of National Statistics (2025).

The correlation analysis demonstrated significant linear relationships between employment and migration indicators, as well as among certain macroeconomic, socioeconomic, and demographic indicators and indicators of education and ICT. Among the migration indicators, the number of arrivals to the Republic of Kazakhstan shows the strongest associations with employment indicators: it is negatively correlated with the number of people employed ($r = -0.8440$) and positively correlated with the number of unemployed ($r = 0.9058$). This pattern suggests that periods with higher in-migration coincide with higher unemployment, which may reflect increased labor-market competition. It is also worth noting the strong inverse correlation between natural population growth and the number of unemployed ($r = -0.9531$), underscoring the relevance of demographic factors to labor-market dynamics.

An analysis of migration and labor market trends in the Republic of Kazakhstan and the Republic of Kyrgyzstan reveals that both countries have experienced cyclical shifts closely linked to major economic and political events. These fluctuations have shaped not only the volume and direction of migration but also the structure and resilience of national labor markets.

In the 1990s, following the dissolution of the Soviet Union, both countries saw large-scale out-migration—especially of skilled professionals—driven by institutional collapse, hyperinflation, and rising unemployment. The resulting brain drain had long-term implications for sectors such as education, healthcare, and engineering. During the early 2000s, Kazakhstan entered a phase of economic expansion that attracted return migrants and foreign labor, particularly to urban and oil-producing regions. In contrast, Kyrgyzstan continued to experience steady emigration due to slower economic growth and political instability, with remittances playing an increasingly vital role.

The 2008–2009 global financial crisis marked a turning point. Kazakhstan faced regional labor market imbalances amid declining investment, while Kyrgyzstan's migration intensified further. In the 2010s, falling oil prices (2014–2016) and structural reforms in Kazakhstan shifted internal migration patterns toward urban centers such as Almaty and Astana. Kyrgyzstan, struggling with a mismatch between education and labor market needs, increasingly relied on labor exports. The COVID-19 pandemic (2020–2021) caused a temporary disruption, triggering the return of migrants and heightening domestic unemployment. However, migration resumed quickly post-pandemic, underscoring the structural dependence of both economies on mobile labor. The war in Ukraine (2022–2023) triggered an increase in in-migration to Kazakhstan, placing additional pressure on urban labor markets but also stimulating demand in logistics, IT, and construction.

The long-term impacts of these migration cycles include persistent regional imbalances, increased labor market segmentation, and the erosion of local human capital in out-migration regions. Migration has become a structural mechanism of labor reallocation that both reflects and reinforces inequalities across space and sectors. These patterns underscore the need for policies that link regional development, education reform, and labor market integration to better manage the effects of migration over time.

Regression analysis of the impact of migration and control variables on the labor market of the Republic of Kazakhstan

Regression analysis estimated the impact of migration and control variables on the labor market of the Republic of Kazakhstan. For this purpose, two regression models were built to assess the impact on the numbers of unemployed and employed people.

Incorporating the results of the correlation analysis, the model, in which the dependent variable was the number of unemployed people in the Republic of Kazakhstan, included the following independent variables: number of arrivals, gross domestic product per capita, rate of graduates of higher education institutions, foreign direct investment, domestic R&D expenditures, share of organizations with access to the internet, share of organizations with internet resources. The resulting

model had a high correlation coefficient (0.9741) and significant explanatory power, as indicated by the refined coefficient of determination (0.9092). The results of the regression analysis are presented in Table 3. In general, the model is as follows:

$$\text{Unemployed population} = 0 + 0.5857 \times \text{Number of arrivals} - 0.3767 \times$$

$$\text{Gross domestic product per capita} + 0.4003 \times$$

$$\text{Graduates of higher education institutions} - 0.0798 \times$$

$$\text{Foreign direct investment} + 0.1190 \times$$

$$\text{Share of organizations with access to the internet} - 0.0492 \times$$

$$\text{Share of organizations with Internet resources.}$$

	Regression coefficient	Standard deviation	Lower bound of the confidence interval	Upper limit of the confidence interval	t	p	H0 (5%)	VIF
Y-section (intercept)	0.0000	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	
Number of arrivals	0.5857	0.1476	0.2517	0.9198	3.9672	0.0033	rejected	3.8399
Gross domestic product per capita	-0.3767	0.1500	-0.7160	-0.0374	-2.5112	0.0332	rejected	3.9636
Graduates of higher education institutions	0.4003	0.1467	0.0685	0.7321	2.7295	0.0232	rejected	3.7885
Foreign direct investment	-0.0798	0.1494	-0.4177	0.2581	-0.5342	0.6061	accepted	3.9292
Internal R&D expenditure from the regions	-0.0444	0.1664	-0.4210	0.3321	-0.2670	0.7955	accepted	4.8798
Share of organizations with access to the internet	0.1190	0.1755	-0.2780	0.5160	0.6779	0.5149	accepted	5.4251
Share of organizations with internet resources	-0.0492	0.1150	-0.3095	0.2110	-0.4281	0.6787	accepted	2.3312

Table 3: Regression model for explaining the unemployment rate in the Republic of Kazakhstan. Source: compiled by the authors based on the Bureau of National Statistics (2025).

Among the variables studied, the number of newcomers shows the strongest statistical association with unemployment (regression coefficient = 0.5857, $p = 0.0033$), suggesting that higher in-migration is associated with higher unemployment. The following variable with the strongest positive impact is graduates of higher education institutions (regression coefficient = 0.4003, $p = 0.0232$). It is possible to assume that a large number of migrants and university graduates increases competition in the labor market, which increases unemployment. On the other hand, gross domestic product per capita shows a significant inverse association with unemployment (coefficient = -0.3767 , $p = 0.0332$), suggesting that unemployment tends to decrease as GDP per capita rises. The other variables are not statistically significant. One of the most significant factors in this regard is the quality of education, as disparities in educational outcomes directly affect the ability of workers, including migrants, to compete for positions in the formal economy. Closely linked to this is the issue of skill mismatches, in which the qualifications and competencies of the labor force do not align with employers' actual needs. Such mismatches may intensify the negative impact of in-migration on unemployment, as both local workers and migrants face difficulties securing stable and adequately paid employment. In addition, migration policies represent a critical dimension shaping labor market outcomes. The presence of national programs to attract skilled specialists, the effectiveness of state initiatives to integrate migrants into the workforce, and targeted measures to retain highly qualified personnel are all decisive for balancing the short- and long-term effects of migration. Incorporating indicators that reflect these policy frameworks into econometric modelling would enable a more comprehensive assessment of the complex interdependencies among migration, employment, and unemployment. Such an approach would not only provide a fuller understanding of current processes in Kazakhstan and Kyrgyzstan but also yield evidence-based policy recommendations designed to harness migration as a driver of sustainable economic and technological development. The following independent variables were included in the regression model to explain the number of employed people in the Republic of Kazakhstan based on the results of the correlation analysis: the number of arrivals, gross domestic product per capita, graduates of higher education institutions, and internal R&D expenditures. The correlation coefficient between the model variables reaches 0.9814, and the refined coefficient of determination is 0.9509. The regression results are shown in Table 4.

The model has the following form:

Employed population = $0 - 0.3733 \times \text{Number of arrivals} + 0.2732 \times$

Gross domestic product per capita - $0.1663 \times$

Graduates of higher education institutions + $0.4552 \times \text{Domestic R\&D expenditure}$.

	Regression coefficient	Standard deviation	Lower bound of the confidence interval	Upper limit of the confidence interval	t	p	H0 (5%)	VIF
Y-section (intercept)	0.0000	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	
Number of arrivals	-0.3733	0.0970	-0.5846	-0.1621	-3.8502	0.0023	rejected	3.0649
Gross domestic product per capita	0.2732	0.0701	0.1205	0.4258	3.8995	0.0021	rejected	1.5997
Graduates of higher education institutions	-0.1663	0.0876	-0.3572	0.0246	-1.8979	0.0820	accepted	2.5026
Internal R&D expenditure	0.4552	0.0731	0.2960	0.6145	6.2300	< 0.001	rejected	1.7406

Table 4: A regression model explaining the indicator of the employed population in the Republic of Kazakhstan. Source: compiled by the authors based on the Bureau of National Statistics (2025).

The regression results show that the variable domestic R&D expenditure has the greatest positive impact on the number of employed people in the Republic of Kazakhstan (regression coefficient = 0.4552, $p = 0.00004$), indicating strong statistical significance. The second strongest positive influence is the variable gross domestic product per capita (regression coefficient = 0.2732, $p = 0.0021$). Spending on research and development can increase labor productivity and create new jobs, especially in high-tech industries. An increase in GDP per capita indicates economic growth, which is often accompanied by higher labor demand. The largest negative regression coefficient is observed with the number of arrivals (regression coefficient = -0.3733 , $p = 0.0023$), confirming the previous conclusion of possible labor-market overload due to in-migration. The variable of higher education graduates in this model is statistically insignificant at the 5% level ($p = 0.0820$) but may negatively impact employment at the 10% level. These results align with the previous regression model, which showed that increases in these variables were associated with higher unemployment rates.

Correlation analysis between migration indicators and the labor market for the Republic of Kyrgyzstan

The results of the correlation analysis for the sample of main and control independent variables formed for the Republic of Kyrgyzstan and key labor market indicators are shown in Table 5. High correlations between the indicators identified variables for further regression analysis.

	Number of registered unemployed	Employed population
In-migration, out-migration (-)	0.2895	0.6683*
Number of arrivals	0.1894	0.6685*
Number of departures	-0.2328	-0.4466
Gross domestic product per capita	0.3535	0.8011*
Graduates of higher education institutions	-0.8293*	-0.3967
Graduates of secondary (complete) education (11th grade)	-0.0157	0.3620
Graduates of secondary vocational education institutions	0.4647	0.6762*
Consumer price index	0.1926	0.3235
Natural population growth	0.0399	-0.2184
Number of young people	-0.7279*	-0.7248*
Total fertility rate	-0.1699	-0.6910*
Foreign direct investment	-0.6097*	-0.4966
GDP growth	-0.2219	0.0632
Hidden and informal economy	-0.3554	-0.2905

Number of state aid recipients registered with social protection authorities	0.5132	0.2398
Number of newly created jobs	-0.6432*	-0.2392
Salary	0.5704*	0.9656*
State budget expenditures on education	0.5339	0.9605*
Number of enterprises and organizations using ICT	0.4575	0.7192*

Table 5: Results of correlation analysis between migration indicators and the labor market for the Republic of Kyrgyzstan (note: * = statistically significant correlations).

Source: compiled by the authors based on the National Statistical Committee of the Kyrgyz Republic (2025).

According to the table, migration indicators are not significantly related to the unemployment rate. For example, the correlation coefficient between the number of arrivals and the number of unemployed is only 0.1894, and between migration growth and unemployment is 0.2895, indicating a weak relationship. However, statistically significant relationships were found between migration and employment: for example, the number of arrivals and the migration stock have correlation coefficients of 0.6685 and 0.6683, respectively, indicating a positive association with employment. Other variables with significant statistical relationships to labor-market indicators (wages 0.9656; state budget expenditures on education 0.9605) were included in the regression analysis as control variables.

Regression analysis of the impact of migration and control variables on the labor market of the Republic of Kyrgyzstan

According to the results of the correlation analysis, the regression model for explaining the number of unemployed people in the Republic of Kyrgyzstan included the following independent variables: graduates of higher education institutions, the number of young people, foreign direct investment, the number of newly created jobs, and wages. The model's correlation coefficient is 0.9536, and the refined coefficient of determination is 0.8445. The results of the regression analysis are presented in Table 6.

The regression model is as follows:

Number of registered unemployed = 0 – 0.5868 ×

Graduates of higher education institutions – 0.1614 ×

Number of young people – 0.0845 × *Foreign direct investment* – 0.286 ×

Number of newly created jobs + 0.1868 × *Wages*

	Regression coefficient	Standard deviation	Lower bound of the confidence interval	Upper limit of the confidence interval	t	p	H0 (5%)	VIF
Y-section (intercept)	0.0000	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	
Graduates of higher professional education institutions	-0.5868	0.1283	-0.8902	-0.2834	-4.5737	0.0026	rejected	1.2703
Number of young people	-0.1614	0.2217	-0.6857	0.3629	-0.7279	0.4903	accepted	3.7932
Foreign direct investment	-0.0845	0.1650	-0.4746	0.3056	-0.5123	0.6242	accepted	2.0998
Number of newly created jobs	-0.2286	0.1919	-0.6823	0.2250	-1.1916	0.2723	accepted	2.8400
Salary	0.1868	0.1917	-0.2665	0.6401	0.9746	0.3622	accepted	2.8356

Table 6: A regression model explaining the indicator of the unemployed population in the Republic of Kyrgyzstan. Source: compiled by the authors based on the National Statistical Committee of the Kyrgyz Republic (2025).

The only variable with a statistically significant and negative impact on the number of unemployed people in the Republic of Kyrgyzstan is graduates of higher education institutions (regression coefficient = -0.5868 , $p = 0.0026$). This indicates a strong inverse relationship: the more graduates from such institutions, the lower the unemployment rate. It can be assumed that graduates of higher vocational education institutions acquire skills and knowledge in demand in the labor market, thereby reducing unemployment. Other variables were statistically insignificant: in particular, wages (regression coefficient = 0.1868 , $p = 0.3622$) and the number of newly created jobs (regression coefficient = -0.2286 , $p = 0.2723$) did not demonstrate a significant impact within the model, despite their logical importance.

The regression model for explaining the number of employed people in the Republic of Kyrgyzstan included the following independent variables: the number of arrivals, gross domestic product per capita, and the graduates of secondary vocational education institutions. The correlation coefficient between the model

variables is 0.9582; the model explains up to 89.09% of the variation in the independent variable, as indicated by the coefficient of determination. The results are presented in Table 7.

The model has the following form:

$$\begin{aligned} \text{Number of employed population} = & 0.4342 \times \text{Number of arrivals} + 0.2828 \times \\ & \text{Gross domestic product per capita} + 0.5935 \times \\ & \text{Graduates of secondary vocational education institutions.} \end{aligned}$$

	Regression coefficient	Standard deviation	Lower bound of the confidence interval	Upper limit of the confidence interval	t	p	H0 (5%)	VIF
Y-section (intercept)	0.0000	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	
Number of arrivals	0.4342	0.1769	0.0340	0.8344	2.4542	0.0365	rejected	3.4415
Gross domestic product per capita	0.2828	0.1843	-0.1341	0.6997	1.5347	0.1592	accepted	3.7340
Graduates of secondary vocational education institutions	0.5935	0.1079	0.3495	0.8374	5.5023	0.0004	rejected	1.2789

Table 7: A regression model explaining the indicator of the employed population in the Republic of Kyrgyzstan. Source: compiled by the authors based on the National Statistical Committee of the Kyrgyz Republic (2025).

The graduates of secondary vocational education institutions and the number of arrivals have a statistically significant positive impact on the number of employed people in the Republic of Kyrgyzstan. In particular, the regression coefficients for the number of arrivals and for graduates of secondary vocational education institutions are 0.4342 ($p = 0.0365$) and 0.5935 ($p = 0.0004$), respectively, indicating a strong relationship between these indicators and employment. In contrast, the variable gross domestic product per capita was statistically insignificant ($p = 0.1592$). Compared with the previous model, an important fact emerges: even though the graduates of higher education institutions reduce unemployment, they do not increase employment. This may indicate certain negative trends: a significant number of graduates of higher education institutions emigrating to other countries, which reduces unemployment in the Republic of Kyrgyzstan but does not increase employment. This may also indicate that the job search is too long, and therefore, the economy cannot

create enough jobs for highly qualified specialists. Another possible reason for this situation could be the high level of informal employment and self-employment.

To mitigate regional inequality in migration, it is important to focus on regional development through decentralization policies and stimulation of local economies. One key method is to create conditions for entrepreneurship in less developed regions, thereby reducing the number of migrants to large cities and reducing regional disparities. Investments in infrastructure, particularly in transport, energy, and communications, will help create new jobs and make rural and remote areas more attractive to local workers and migrants. An important aspect is promoting local education and vocational training that would improve workforce skills and reduce dependence on internal and external migration. The integration of migrants into the workforce requires the development of support programs that provide access to professional retraining, language courses, and social adaptation. This will reduce the social tensions associated with significant migration and promote the successful integration of migrants into local labor markets. In addition, the state can encourage foreign investment in rural and less urbanized regions by creating special economic zones or offering investment incentives to companies willing to develop their business in such areas. Investments in local businesses not only create new jobs but also contribute to regional economic development, reducing the need to migrate to large cities for employment.

DISCUSSION

The statistical analysis of employment and unemployment trends in the Republic of Kazakhstan and the Republic of Kyrgyzstan showed a gradual stabilization of the ratio of these indicators in the national labor markets. This statement also holds for migration trends: in 2022–2023, the countries saw a rapid increase in the migration balance. At the same time, the regression analysis revealed several problems specific to the labor markets of the Republic of Kazakhstan and the Republic of Kyrgyzstan. Thus, a direct impact of the number of newly arrived migrants and the university graduates on the unemployment rate in the Republic of Kazakhstan was identified. For the Republic of Kyrgyzstan, the results suggest that higher numbers of graduates of higher-education institutions are associated with lower unemployment, but not with higher employment; this pattern may point to brain drain, with educated young people leaving to find work abroad. Among the positive trends, it was found that growth in gross domestic product per capita is accompanied by a decrease in the Republic of Kazakhstan's unemployment rate, and that research and development expenditures contribute to increased employment. The graduates of higher education institutions have an inverse relationship with the number of unemployed people in the Republic of Kyrgyzstan. The graduates of secondary vocational education institutions and the number of newly arrived migrants have a significant

positive impact on the number of employed people in the Republic of Kyrgyzstan. Comparing the identified interdependencies with labor market trends and migration dynamics in other countries yields important insights into the causes and consequences of migration processes and suggests possible areas for improvement.

Similarly to the current study, Greenwood (2021) emphasized the role of economic opportunities (e.g., improved welfare, economic status) in migration processes. Wang & Shen (2022) noted that economic status advantages can be substantial in migrants' intentions to settle in a city, even when overcoming institutional barriers. Statistical analysis by region of the Republic of Kazakhstan and the Republic of Kyrgyzstan also demonstrated that higher economic opportunities attract internal and external migrants. In turn, these trends may lead to increased competition in the labor market and unemployment. These findings were reflected in Selod & Shilpi (2021), who noted that migration from rural to urban areas brings both significant gains and significant losses.

Gillespie et al. (2022) and Bilovodska et al. (2024) found that labor market stability promotes return migration. Using the example of the Republic of Kyrgyzstan, the authors suggested that the return of labor migrants tends to increase unemployment. Differences in the results may be due to regional peculiarities; for example, the return of labor migrants to the Republic of Kyrgyzstan could be driven by changes in the conditions of their stay in other countries, rather than by the stabilization of the national market.

Aksu et al. (2022) studied the impact of the arrival of a significant number of refugee migrants from Syria to Turkey on the local labor market. The researchers determined that this could have significant negative consequences for the local population, especially those involved in the informal sector of the economy. At the same time, researchers have recorded some positive changes in the formal sector, such as higher wages. At the same time, the overall impact of the in-migration was virtually zero for local men, but unfavorable for women, as it did not increase their employment in the formal sector. The study did not investigate the impact of migration by gender. However, in general, migration, particularly the in-migration after the outbreak of war in Ukraine, has been identified as one of the key factors behind the rise in unemployment.

Lebow (2022) and Peñaloza-Pacheco (2022) studied the impact of migration from Venezuela, driven by the country's economic and social crisis, on the Colombian labor market. The authors noted that an increase in labor supply in the market led to a decrease in hourly wages and reduced the level of employment in the informal sector and the employment rate of low-skilled workers. In contrast, Groeger et al. (2022) found that in-migration from Venezuela into selected cities in Peru improved labor market outcomes for locals and had other positive effects. In turn, Ivanchenkov et al. (2024) and Boruchowicz et al. (2024) determined evidence of a decline in employment among local workers in Lima (Peru) after the arrival of migrants from Venezuela. The study found that the number of arrivals in the Republic of Kazakhstan

negatively affected employment, whereas the number of arrivals in the Republic of Kyrgyzstan positively affected it. These findings once again emphasize the importance of considering economic conditions in recipient countries: in Kazakhstan, migrants could increase labor-market competition, and in Kyrgyzstan, migrants could fill labor shortages. It is also necessary to address regional differences and analytical approaches that may have contributed to the contradictions in the studies on Venezuela.

Several studies have analyzed the impact of migration on the labor markets of some developed countries, suggesting the importance of an effective integration policy. For instance, Azoulay et al. (2022) found that migrants to the United States mainly create new jobs by founding companies and businesses rather than taking jobs from locals. Gianfreda & Vallanti (2024) used the example of Italy to show that immigration can positively affect the incomes of the local population in certain sectors and can also reduce income inequality.

Schneider (2022) found that migration trends in the European Union following the 2004–2007 enlargement led to a loss of about 10% of the population of the new member states, thereby depleting the national labor force. At the same time, migration has contributed to regional convergence, reducing unemployment and increasing gross domestic product per capita. The author of this study confirmed the direct impact of an increase in gross domestic product per capita on employment but found a significant negative impact from the number of arrivals.

As an example of Slovakia, Přívara (2021) determined that the main drivers of migration to other countries are unemployment, labor market regulation, and the expansion of the European Union. In the author's study, the number of outgoing migrants does not have a statistically significant impact on unemployment and employment rates in both the Republic of Kazakhstan and the Republic of Kyrgyzstan. This may indicate that, in these countries, out-migration is compensated for by other factors, particularly the number of arrivals.

Certain studies have revealed the consequences of labor migration not only through its connection to countries' economic situations and labor markets, but also through changes in migrants' circumstances. These studies often raise concerns about discrimination when the decision to hire or fire an employee is influenced not only by their knowledge, skills, and productivity, but also by factors not directly related to workplace performance. Olivieri et al. (2021) and Shevchuk & Radelytskyy (2024) noted that migrants from Venezuela to Ecuador have, on average, higher skill levels than locals. However, their employment in this host country is of significantly lower quality than that of Ecuadorians. Auer (2022) noted the problem of discrimination against migrant workers after the economic downturn due to the pandemic in Germany and other European countries. Platt et al. (2022) provide evidence that effective anti-discrimination policies can increase the likelihood that emigrants succeed in the labor market.

Several studies identified additional factors that influence the labor market alongside migration and other socioeconomic and demographic factors. Su et al. (2022) stated that technological innovations give impetus to labor market development, citing China as an example. An et al. (2024) highlighted the importance of proper regulation, citing the Republic of Tajikistan and China as examples. Liadskyi et al. (2022) and Dinkelman et al. (2024) investigated the effects of temporary investment increases in non-agricultural physical and human capital in Africa. These studies highlight the complex interrelationships and multiple influencing factors in labor markets across countries, offering opportunities for further research.

Despite the importance of the topic, the study has several limitations that require further study. There is insufficient attention to deeper theoretical foundations, in particular to the analysis of migration processes through the prism of social and development theories, which could provide a better understanding of the causal links between migration and the labor market. Since migration is a multifaceted phenomenon encompassing social, economic, and cultural factors, it would be useful to focus on these aspects to provide a more informed explanation of its impact on different segments of the labor market. Research needs a deeper analysis of migration policy and its impact on the economy, particularly regarding political strategies to attract foreign workers, promote worker mobility, and mitigate the negative effects of brain drain. Taking into account the political and legal aspects of migration will allow for a more accurate assessment of how government initiatives affect the economic and social integration of migrants, especially in developing countries such as Kazakhstan and Kyrgyzstan.

CONCLUSIONS

The results of the statistical analysis of the data of the Republic of Kazakhstan showed that throughout the study period, the country mainly had a negative migration balance, reaching a peak in 2019 (–32,970). In 2022, the migration balance began to grow, and in 2023, it became positive for the first time in the study period (+9293). This may be due to both the improved economic situation and the in-migration resulting from the war in Ukraine and support programmes. The migration balance of the Republic of Kazakhstan shows significant regional differences, with a particular increase observed in regions with developed infrastructure, broad economic and educational opportunities, and a developed oil industry. Migration trends in the Republic of Kazakhstan may be closely linked to labor-market trends. During the period under review, the number of employed people in the Republic of Kazakhstan grew, while the unemployment trend remained unchanged. In 2023, the number of employed people was approximately 9.08 million, and the number of unemployed people was 452,194. The unemployment rate also shows noticeable regional differences, with the highest numbers of unemployed people in densely populated cities

and agricultural regions, particularly in the cities of Almaty and Astana, as well as in the Turkestan and Almaty regions.

In the Republic of Kyrgyzstan, from 2014 to 2020, there was steady out-migration with a peak in 2014 (-7,757), but in 2021, the number of arrivals increased sharply and almost equaled the number of departures. In 2022, the migration balance became positive, and in 2023 it reached 9,843 people, which can be attributed to both improved economic conditions and the complications of travelling to other countries, as well as the increase in migration due to the war in Ukraine. In 2024, the Republic of Kyrgyzstan had a positive migration balance in all regions. The highest migration growth is characteristic of regions with a high population density and a developed agricultural sector, as well as cities that provide broad economic and educational opportunities. The number of employed persons in the Republic of Kyrgyzstan grew slowly but steadily during the period under review; the number of unemployed persons also increased in 2017–2020. However, as in the Republic of Kazakhstan, the labor market in the Republic of Kyrgyzstan has stabilized following the shock of the pandemic. The number of employed people in 2023 was 2.66 million, and the unemployed population was 67,600. In 2024, the largest number of unemployed people was present in densely populated regions and rural areas, particularly in the Osh and Jalal-Abad regions.

The results of the regression analysis confirm the significant impact of migration on unemployment and employment rates in Kazakhstan and Kyrgyzstan, consistent with the push-pull theory. Migration patterns are determined not only by economic conditions, but also by political and social conditions, as well as the infrastructure capabilities of urban centers. Economic crises or political instability, such as the war in Ukraine or the financial crisis, cause sharp changes in migration, which intensifies competition in the labor market, especially in large cities. The theory of “structural change” holds that increased migration leads to a significant redistribution of jobs, particularly in the informal sector, thereby significantly affecting labor market stability. Internal migration from rural areas to cities also increases competition for jobs, requiring the implementation of migrant integration policies and improved social protection. These results are consistent with the theory of economic adaptation of migrants, which holds that migrants’ success in the labor market depends not only on external conditions but also on government policies that promote their integration. Our findings show that effective integration policies can significantly mitigate the negative effects of migration, in particular by reducing unemployment and improving the quality of employment. Overall, the study demonstrates that migration has a complex, multifaceted impact on the labor market, requiring a comprehensive approach to developing policies and strategies for migrant integration and the development of regional labor markets.

The results of correlation and regression analyses for the Republic of Kazakhstan revealed that the number of new entrants and graduates of higher education institutions has a statistically significant and direct impact on the number of unemployed

people. Growth in gross domestic product per capita is associated with a decline in the unemployment rate. The number of employed people is statistically significantly affected by variable domestic R&D expenditures and gross domestic product per capita. The number of arrivals has a negative impact. The number of graduates of higher education institutions has a statistically significant negative impact on the number of unemployed people in the Republic of Kyrgyzstan. The graduates of secondary vocational education institutions and the number of arrivals have a positive impact on the number of employed people in the Republic of Kyrgyzstan. Prospects for further research include expanding the model to include variables characterizing regulatory policy, the level of informal employment, gender differences in the labor market, and the quality of migrants' integration into the scientific and technical sphere.

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POVZETEK

VPLIV MOBILNOSTI ČLOVEŠKEGA KAPITALA IN MIGRACIJ NA GOSPODARSKI IN TEHNOLOŠKI NAPREDEK

Dilbara Amanturova, Lyailya Kabylbayeva, Chinara Amanturova, Damira Musuralieva, Farhat Sariev

Avtorji v študiji proučujejo povezavo med mobilnostjo človeškega kapitala, migracijami ter dinamiko trga dela v Kazahstanu in Kirgizistanu, pri čemer se osredotočajo zlasti na posledice za gospodarski in tehnološki napredek. Raziskava temelji na uradnih statističnih podatkih za obdobje med letoma 2014 in 2024, ki pridobljenih iz Urada za nacionalno statistiko Republike Kazahstan ter Nacionalnega statističnega odbora Republike Kirgizistan. Za metodološki okvir so avtorji uporabili statistično analizo zaposlenosti, brezposelnosti in migracijskih trendov; korelacijsko analizo za identifikacijo linearnih povezav med migracijskimi kazalniki in rezultati trga dela; ter regresijsko analizo za oceno stopnje in smeri vzročnih povezav ob upoštevanju makroekonomskih, sociodemografskih, izobraževalnih in inovacijskih spremenljivk.

Rezultati kažejo, da je imel Kazahstan v preučevanem obdobju pretežno negativno migracijsko bilanco, se je v pozitivno spremenila šele leta 2023, predvsem zaradi zunanjih pretresov, kot je vojna v Ukrajini, ter notranjih ukrepov za izboljšanje gospodarskih razmer. Pozitivni migracijski trendi so bili prisotni predvsem v urbanih središčih in na območjih, bogatih z naravnimi viri, medtem ko je bil za obrobne regije značilen odliv prebivalstva. Kazalniki trga dela so pokazali postopno rast zaposlenosti z občasnimi zastoji kot posledico pandemije in politične nestabilnosti, medtem ko so bile pri brezposelnosti prisotne znatne regionalne razlike. Regresijski modeli so pokazali, da se s prihodi migrantov in številom diplomantov visokošolskega izobraževanja ter posledično okrepljeno konkurenco na trgu dela brezposelnost povečuje, medtem ko rast BDP na prebivalca in domačih izdatkov za raziskave in razvoj zmanjšuje brezposelnost in spodbuja rast zaposlenosti.

V Kirgizistanu so se migracijski vzorci spremenili iz stalnega odliva med letoma 2014 in 2020 v pozitivno bilanco po letu 2021, kar kaže na izboljšanje gospodarskih razmer in omejene možnosti za izseljevanje. Regionalna analiza je pokazala, da so večino novih priseljencev privabljala gosto naseljena območja, kot so Oš, Džalalabad in Biškek, obenem pa so bile zaznane tudi višje stopnje brezposelnosti, zlasti na podeželskih območjih, za katere je značilno sezonsko zaposlovanje.

Ugotovitve študije kažejo na dvojni vpliv migracij na gospodarski in tehnološki napredek. Gledano kratkoročno se s krepitvijo migracij povečujeta konkurenca na trgu dela in pritisk na brezposelnost, zlasti v urbanih in industrijskih predelih. Dolgoročno pa lahko naložbe v raziskave in razvoj, informacijske in komunikacijske tehnologije ter človeški kapital te trende spremenijo v gonilo inovacij, produktivnosti in trajnostne rasti. Študija izpostavlja pomen uravnoteženih državnih politik,

usmerjenih v integracijo upravljanja migracij z gospodarsko diverzifikacijo in tehnološkim napredkom v obeh preučevanih državah.

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