Research Article

Received: 11 July 2024 / Accepted: 31 October 2024 / Published: 05 November 2024

Addressing Internal Migration Challenges in Kazakhstan: A Systematic Approach

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DOI: https://doi.org/10.36941/ajis-2024-0195

Abstract

This research article provides a comprehensive analysis of migration processes within Kazakhstan, focusing on the challenges in internal migration. The current trends in internal migration are leading to substantial differences in the distribution of the workforce, negatively affecting both the economy of the country and regional inequalities. The authors present an economic and mathematical model that demonstrates a connection between a decrease in the appeal of migration to certain locations and a fall in the gross regional product. Furthermore, a thorough examination of the legal framework, program execution, and policy documents reveals problems in the effective use of regulatory mechanisms, particularly in relation to rural migration issues. The study presents a systematic approach and an organizational regulatory scheme to improve the scientific methodology. This scheme takes into account numerous aspects and conditions that affect internal population migration dynamics.

Keywords: *migration, migration policy, migration flows, regional economy*

1. Introduction

Process migration refers to “transferring a process between two machines”. It provides the ability to distribute loads dynamically, recover from faults, simplify system administration, and improve data access locally. Despite the objectives and continuous scientific endeavors, migration has not achieved “widespread use (Milojičić et al. 2000, p. 241).

Population migration, both worldwide and internal, is a natural process, that is driven by a shift in individuals’ life priorities, and a decline in the quality of their living conditions. Such a complex combination of factors and conditions that shape migration processes necessitates careful consideration by public administration. These processes profoundly and potentially have both

negative and positive effects on the socio-economic development of countries and regions.

Researchers have found both internal and international migrations have long-lasting impacts on various elements of life in the interconnected world, including social, economic, political, and cultural dimensions (Nagesha 2023).

The 2030 Agenda for Sustainable Development, which was approved in 2015, for the first time acknowledges migration as a component of development. Moreover, out of the 17 Sustainable Development Goals, 11 of them include specific targets that are directly related to migrants, migration, and mobility (United Nations 2015).

The increasing intricacy and division of labor markets, together with corresponding rises in educational attainment and occupational specialization, incentivize individuals to relocate for employment, education, and familial reasons. Economic and human growth often leads to an increase in migration in low-income societies as people's capacities and opportunities are enhanced (Haas et al. 2019).

According to the World Migration Report 2022, the total number of international migrants was 281 million, or 3.6% of the world's population, in 2020. Moreover, this number increased from 272 million in 2019 and it is 128 million more than in 1990. (International Organization for Migration 2022)

Simultaneously, the accessible data indicates a general rise in remittances over the past few decades, from $126 billion to $702 billion. Contrary to expectations of a significant decrease in international remittances as a result of the COVID-19 pandemic, the global total for 2020 only experienced a minor loss of 2.4% compared to 2019 (International Organization for Migration 2022).

This suggests that the global population of individuals residing and working in foreign countries is increasing annually. However, this may also validate the fact that as people search for a "better life," there is a growing trend of population mobility occurring inside states and across national borders.

Peng T. (Peng, 2023) explores aspects of migration and focuses on economic instruments for regulating migration processes. Lagakos D. (Lagakos, 2020) points out in his study that financial support does not guarantee a proper level of regulation of migration processes within the country. There is also a need for effective management of programmes to manage migration flows. Mukashov A. (Mukashov, 2023) focuses deeply on the economic instruments used to manage internal migration. He highlights the importance of tax measures and financial support used to attract migrants to less developed regions, as well as their impact on reducing economic inequalities. His study demonstrates how economic instruments contribute to the redistribution of resources and support for economic development in different regions.

The Republic of Kazakhstan has for many years been characterized by serious regional demographic and economic imbalances, which have a negative impact on the social and economic development of the country as a whole and each region individually, depending on Whether a particular region is labour-intensive or labour-intensive. Since 2014, the migration mobility of the population in Kazakhstan has increased significantly, and a trend towards sustainable growth of internal migration (both regional and interregional) is recorded. Uneven regional development can cause social and economic imbalances, creating a need for the development and application of more effective economic instruments to manage internal migration in order to ensure sustainable and harmonious development of the country.

In Kazakhstan, migratory movements are directed mainly from the northern regions into the interior of the country and from the southern regions to megacities. As a result, there is a mixed population dynamics of the regions and a change in the distribution of the population on the territory of the republic. Moreover, on the one hand, urbanization is a catalyst for economic development, becoming more efficient and diversified. But, on the other hand, massive spontaneous migration from rural to urban areas creates problems for rural areas where there is a shortage of workers. The present challenges for research include the following:

- analyzing the economic factors influencing internal migration in Kazakhstan;

- assessing the efficacy of government policies in regulating migration processes in Kazakhstan;
- identifying the causes of interregional population disparity in Kazakhstan.

2. Materials and methods

The study employed a mixed-methods approach to investigate the impact of migration on the region's economic development. This methodology combines expert analytical methods, economic modeling, and mathematical modeling approaches.

Advanced analytical approaches employ subject matter experts to analyze and interpret data, providing valuable insights into the factors and conditions shaping internal population migration trends.

We employ economic modeling to quantify and simulate the economic implications of internal migration patterns, offering a structured framework for assessing the impacts on the socio-economic development of regions.

Mathematical modeling entails the use of mathematical techniques to represent and analyze complex relationships within internal migration processes, allowing for a more detailed examination of the dynamics at play.

The main goal of this methodological approach is to achieve a more thorough and equitable analysis of the factors that influence internal migration trends. The project's aim is to strengthen the assessment of the socio-economic impact of these processes on regional development, as well as formulate recommendations for a systematic approach to state regulation of internal migration.

The primary data for this study was acquired from the National Bureau of Statistics, covering the period from 2015 to 2023.

A review of scientific studies in this particular area indicates its limited scope, as it solely focuses on evaluating the level of attractiveness of different places in Kazakhstan.

For example, Bektleeva (2020) is developing a methodology for assessing the social attractiveness of the regions of Kazakhstan, which is based on a point assessment of the levels of condition in preschool education, secondary general and technical and vocational education, higher education, healthcare, housing improvement, etc. (Table 2)

Table 2. Estimates of the social attractiveness of Kazakhstan's regions based on factor measurements in 2019

Regions	Points
East-Kazakhstan	11,85
Almaty city	11,8
Karaganda	11,5
Pavlodar	11,9
North-Kazakhstan	9,95
Astana city	9,55
Kostanay	10,2
Shymkent city	8,65
Aktobe	8,45
Akmola	7,6
Alma-Ata's	7,6
Mangistau	7,0
Kyzylorda	6,95
West-Kazakhstan	6,65
Atyrau	6,45
Jambyl	5,45
Turkestan	3,8

Note: source (Bektleeva 2020)

Hence, the data analysis in Table 2 enables us to all regions according to levels of social attractiveness into 5 groups:

1. Relatively high social attractiveness, but there are problems in the provision of kindergartens (Almaty, East Kazakhstan, Karaganda, Pavlodar regions);
2. A high level of social attractiveness, but there are problems in the provision of kindergartens and student places in schools (Astana, North Kazakhstan, Kostanay, Aktobe regions);
3. Insufficient level of social attractiveness, while there are equally problems in education and healthcare (Shymkent, Akmola, Almaty regions);
4. Low level of social attractiveness, while there are problems with the provision of secondary education services, universities, as well as a low level of median income among the population (Mangistau, Kyzylorda, West Kazakhstan, Atyrau, Zhambyl regions);
5. The worst indicators of social attractiveness among the regions of the Republic of Kazakhstan (Turkestan region).

After comparing the social attractiveness levels of various regions with their migration patterns, Bektleeva (2020) concludes that one of the reasons for the growing migration to the cities of Almaty and Astana, perhaps even the most important, is their high level of social attractiveness.

At the same time, the population migrates to Shymkent and the Mangystau region, despite their insufficient and low social attractiveness, respectively. The population is declining in the Pavlodar, East Kazakhstan, Aktobe, Kostanay, North Kazakhstan, and Karaganda regions, despite the fact that the level of social attractiveness in these regions is relatively high.

In general, we can agree with this expert that it is necessary to develop targeted tools for regulating migration processes for each region, which will allow the state to monitor the implementation of standard life strategies with the identification and elimination of constraint factors along this path (Podgorskaja, 2021).

In our study, the model is used for the purpose of analyzing the current trend of migration processes' influence on macroeconomic indicators of development of the region, for which data from official statistics of Zhambyl and Almaty regions over an 8-year period are sufficient. The work did not aim to make forward-looking projections, which would require longer use of statistics.

The variable is the migration attractiveness index, which was calculated by the author himself for the period under analysis.

In order to study the processes of migration processes on the economy of regions, we consider it possible to apply such economic-mathematical tools as an econometric model:

$$M_{i,t} = f_i (GI_{i,t}) \quad (1)$$

where $M_{i,t}$ is a macro-indicator of development of the i region at time t;

$GI_{i,t}$ is a generalized indicator that reflects the essence of internal migration in the region i at time t.

The gross regional product (GRP) can be used as a macro indicator, and the migration attractiveness index (IMP) as a generalization indicator.

Migration attractiveness index is calculated on the basis of the number of arrivals and departures in a given period for a particular region. The number of people who arrived in the region for one year is divided by the number of people who left the region during the same period as part of interregional migration.

The migration attractiveness index is calculated on the basis of data on arrivals and departures for a given region over a certain period, in particular for the year.

Model parameters are calculated on the basis of a special data processing program using the smallest squares. It is a standard procedure successfully applied in the analysis and prediction of complex, dynamic systems.

The universality of the model is that a similar model approach can be applied to other regions of Kazakhstan, as well as in studies of migration processes in other countries.

The methods of collection included independent work with data from the National Bureau of Statistics, the departments of statistics of the regions under consideration of Kazakhstan on the respective sites of these bodies, as well as on the basis of formal written requests to statistical

authorities.

The criterion for selecting two regions to develop a model toolkit was the maximum difference between their attractiveness indices, which allowed a clearer identification of patterns and trends in internal migration.

3. Results

3.1 Regulatory measures

As it is known from many years of economic practice, the successful development of complex socio-economic systems is possible only under the conditions of their effective management. This is an axiom that does not require proof. Such management must necessarily be based on perfect legislative and regulatory support, adequate to the tasks of not only current but also future development.

From these positions, there is an urgent need to analyze the basis on which the system of regulation of internal migration processes rests.

The original legislation dealing with general migration management issues was adopted in December 1997 (Law of the Republic of Kazakhstan dated 13 September 1997 No. 204). The law covered a system of norms and rules for regulating public relations in the field of population migration, defining the legal, economic, and social foundations of migration processes, as well as creating the necessary conditions for the adaptation of individuals and families returning to their historical homeland. However, in our opinion, internal migration is mentioned only in Article 41, where it is established that issues are regulated in accordance with the legislation of the Republic of Kazakhstan. However, given the small-scale nature of these processes and their non-negative impact on the socio-economic development of the country and its regions, the legislative framework in force at that time did not fully account for the nuances of internal migration.

Taking into account the growing problems of internal migration and the awareness of the need to regulate these processes, within the framework of the new Law "On Migration" of 2011, current issues were considered somewhat more broadly in the norms set out in two chapters (The Law of the Republic of Kazakhstan dated 22 July 2011 No. 477-IV).

In particular, Chapter 9 divides internal migrants in Kazakhstan into two groups: those relocating in an organized manner (in accordance with the resettlement quota or resettled in accordance with the laws of the Republic of Kazakhstan) and those relocating independently on their own will (Article 50), establishing their basic rights and obligations (Article 51).

Chapter 10 also defines measures to assist internal migrants, in the form of establishing a quota for the resettlement of internal migrants,obtaining migrant status (Article 52), and providing social support for those included in the resettlement quota (Article 53).

In the subsequent period of time, until 2023, periodically in the current Migration Law numerous adjustments have been made and, until recently, are being made, and in terms of internal migration, the timing of the introduction of certain norms into action, when making changes and additions to the legislative field, including with the adoption of the Social Code of the Republic of Kazakhstan.

These legislative acts also facilitate the adoption of conceptual documents that guide the implementation of migration policy in Kazakhstan.

In particular, in 2017, the Concept of Migration Policy in the Republic of Kazakhstan for 2017-2021 was adopted (Decree of the Government of the Republic of Kazakhstan dated September 29, 2017 No. 602). The Concept was developed in accordance with international law and international obligations of Kazakhstan in the field of migration, sustainable development goals for the period until 2030, adopted in the resolution of the UN General Assembly in the fall of 2015. It was also adopted in regard with the expected prospects for the economic, social, and demographic development of the country in the context of deepening Eurasian integration processes within the framework of the Eurasian Economic Union and global globalization trends.

In our opinion, it was mainly the processes of Eurasian integration that caused the need to adopt Concept 2021, since in the context of the implementation of the principle of freedom of movement of labor resources in the common space of the EAEU, both opportunities appeared for solving the problems of employment for the working population of Kazakhstan and considerable risks for the balance of the internal labor market.

For this reason, the conceptual document largely ignored the issues of internal migration and did not incorporate them into its framework. In the period until 2023, the current Migration Law shall be amended periodically by laws of 13.06.2013. 102-V, 24.11.2015. 421-V, 22.12.2016. 28-VI, 16.04.2018. 147-VI, 13.05.2020. 327-VI and 20.04.2023. 226-VIVII - The changes and the time-frames for the implementation of certain norms are made, when legislative changes and additions are introduced, including with the adoption of the Social Code of the Republic of Kazakhstan.

The country's evolving legal framework is reflected in the development and implementation of policy and policy documents on both external and internal migration.

However, it must be noted that the living practice is richer and broader than any theory, so it can be assumed that the author's studies will serve to further improve the processes of regulating migration at macro-, meso- and micro levels of governance. And here, in the opinion of the author of the publication, it is important to solve problematic aspects of the legislation on local self-government.

At the same time, the trend of mass, spontaneous migration from rural areas to cities has begun to grow, which cannot help but cause problems both for rural areas, where there is a shortage of workers, and for cities. Cities face challenges in housing construction, engineering infrastructure development, social service development, and resident environmental safety.

The article presents the prevailing opinion in the scientific and expert environment that the spontaneous, unmanaged migration from rural areas on the one hand leads to problems in rural areas, because it migrates mainly the working population and features - youth. The load on cities increases with the curve.

According to official data, in 2024 the level of urbanization was about 63%. That is, 37% of the population lives in rural areas. Out of the country's total population of 20.2 million people, 7.52 million live in rural areas (1 September 2024). According to the data of state bodies under the document "Concept of rural development for 2022-2027" (Concept for the Development of Rural Areas, 2023) provided data that "As a result of 12 months 2022 the negative balance of migration in rural areas was 67 thousand. people. (in 2020 - 81.3 thousand. people, in 2021 - 77.3 thousand. people)". In three years, the number of rural settlements has been reduced by 21. Employment in agriculture is also declining throughout the country. In our view, the current trend of rural population decline and the predominance of urbanization processes is highly dangerous for the sustainable development of Kazakhstan.

In this context, the author proposes to implement flexible diversification of production in rural areas, with a view to creating additional jobs and more fully realizing the unexploited potential of productive and economic development.

At the same time, in the central, northern, and eastern regions of the country, due to low natural demographic growth, which does not ensure replenishment of migration outflow, there have been clear trends in population decline, with all the ensuing consequences for these regions.

One cannot argue that public management is not addressing these issues. The employment programs implemented from 2011 to 2021 specified measures to address the regional imbalance in population settlement. During the period 2017-2020 alone, within the framework of these programs, about 32 thousand people were resettled to Akmola, East Kazakhstan, Kostanay, Pavlodar, and North Kazakhstan regions; half of them were people of working age.

However, all the measures taken did not have the desired effect, and therefore it can be considered timely to adopt an updated conceptual document (the Concept of Migration Policy of the Republic of Kazakhstan for 2023-2027) strengthened by a specific mechanism and tools for regulating both external and internal migration of the population (Decree of the Government of the Republic of

Kazakhstan dated November 30, 2022 No. 961).

Specifically, the new Concept 2027 outlines seven key areas for migration policy implementation, with only one specifically addressing internal migration regulation. This seventh area aims to promote internal mobility among Kazakhstanis, thereby balancing the demographic disparities between labor-surplus and labor-deficient regions abroad.

This direction provides mechanisms to more effectively regulate internal migration processes, primarily to stimulate citizens' movement to the northern and central regions. In particular, a number of proactive measures are envisaged:

a. the introduction of a mobility certificate, with the right to financial assistance in the amount of 50% of the cost of housing in a new place for displaced persons if they have employment confirmed by the employer, which can be used for the construction or purchase of housing or for making an initial contribution to a housing savings fund bank. At the same time, it is expected that additional direct and indirect measures will be taken to encourage employers to hire migrants from labor surplus regions;
b. optimization of the internal economic mobility, bearing in mind:
- development and implementation of special regional programs to stimulate relocation, aimed at creating poles of economic growth outside the main agglomerations;
- active information support for the implementation of special regional programs;
c. covering the shortage of personnel in villages, with a view to planning measures to increase the attractiveness of the project «With a diploma in the village» by taking additional incentive measures for social support;
d. the formation of regional Labor Mobility Centers for the development of forecast scenarios for the development of events for short-, medium- and long-term periods, organization and coordination of migration activities on the ground.

In the medium term until 2027, it is expected that, through all these incentive measures, the share of arrivals in the northern and eastern regions in the scale of internal migration flows will reach 16.2% (On approval of the Concept of Migration Policy of the Republic of Kazakhstan for 2023-2027. Resolution of the Government of the Republic of Kazakhstan dated November 30, 2022 No. 961).

Kazakhstan has adopted and continues to adopt acts focused on the development of rural areas, in addition to these documents that establish a legislative and regulatory framework for general migration processes.

In 2003, Kazakhstan adopted the State Program for their Development for 2004–2010, Section 7 of which outlined measures for forming controlled mass migration flows of the rural population in line with the program's implementation stages (Decree of the President of the Republic of Kazakhstan dated July 10, 2003 No. 1149 2003). In other words, it meant the resettlement of the rural population from places with unfavorable environmental conditions, as well as those belonging to a group with a weak level of development and low indicators of economic potential, to places prepared for normal living without disturbing the overall socio-economic balance.

As you can see, these were, in our assessment, real steps towards solving the problematic aspects of rationalizing rural migration and reducing its spontaneous, uncontrollable forms of manifestation. At the same time, due to the excessive reform initiatives that we mentioned above, which caused significant damage to the agricultural sector of the economy, the plans of the State Program 2010 remained virtually unfulfilled.

In 2023, the Concept for the Development of Rural Areas for 2023-2027 was adopted (Decree of the Government of the Republic of Kazakhstan dated March 28, 2023 No. 270). The Concept postulates that villages are equal participants in the public administration system based on the effective distribution of powers between levels of executive power and the maximum involvement of local governments, businesses, and citizens in the implementation of reforms for the sustainability of rural areas. At the same time, sustainable development of rural areas involves relying on the following principles:

- "People are at the center", meaning the formation of rural development policies in the

interests of people;
- Increasing the contribution of rural areas to the socio-economic development of the country, including through continuous improvement of the efficiency and productivity of agriculture;
- "People to infrastructure", meaning reducing the migration outflow of the rural population to cities by promoting their natural concentration in villages that have development potential with developed infrastructure.

In our opinion, among these principles, in addition to their general emphasis on the interests of the rural population, we can highlight the second principle, which focuses on increasing the village's contribution to the socio-economic development of the country and regions.

Specific quantitative assessments of the contribution, whose importance is difficult to overestimate, seem to support this principle. To substantiate this thesis, we need to look back to the era of the planned economy, when the social sphere developed based on the infamous residual principle. To increase funding for this sphere, the scientific community of those times made significant efforts to substantiate the importance of the social factor of economic growth by deriving estimates of its economic efficiency.

Thus, in order to identify assessments of the effectiveness of rural areas, it is necessary to expand scientific and methodological research, including using modern economic and mathematical tools for analysis and forecasting.

Certainly, domestic scientists and management practitioners are researching and making various proposals on issues of rational regulation of internal migration.

For example, Bezhkenov (2022) believes that in order to carry out a successful policy of relocating internal migrants from labor-abundant regions to labor-deficient ones, it is necessary to urgently use the factor of educational migration by redistributing state educational grants in favor of labor-deficient regions.

Such an approach, in our opinion, can also help reduce the undesirable tendency of the outflow of young people who want to get an education abroad but do not have sufficient prerequisites for this.

It is also possible to use the potential of the housing factor, meaning the activation of new housing construction in the same labor-scarce regions, with a significant quota for internal migrants, providing benefits and preferences to attract developers. Moreover, it is possible to draw secondary housing resources from the housing funds managed by the executive bodies in these regions. Simultaneously, we could consider bolstering the standing of the agricultural sector, particularly peasant (farm) farms, and expanding non-agricultural forms of activity to diversify production. This could serve as an economic tool to curb irrational rural migration patterns.

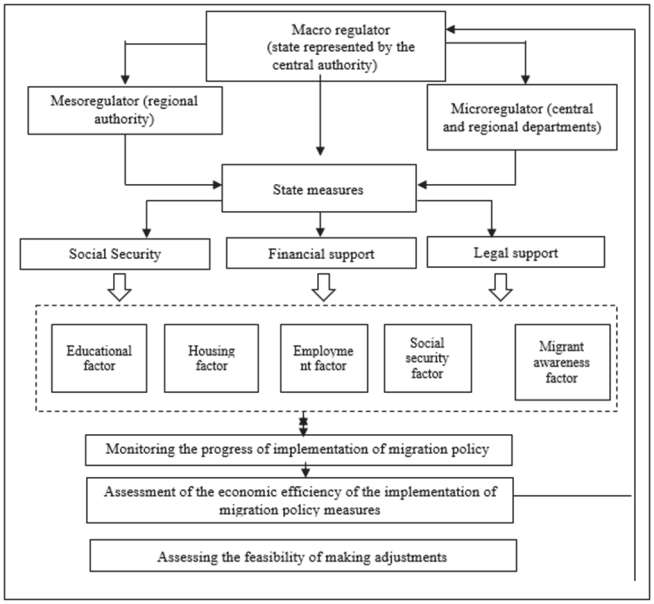
In our opinion, rural tourism, which is a form of ecotourism applied to the agricultural sector of the economy, can serve as a similar diversification activity. Its active development can have a significant multiplier effect, particularly in the context of regional clusters formation. Indeed, rural residents are involved not only in the sphere of servicing ecotourists but also develop such areas of additional labor activity as folk crafts, familiarization with national cuisine, as well as in the production of other related services in the hospitality sector, etc.

In general, according to many experts, rural tourism makes it possible to seriously diversify the sectoral structure of activities in rural areas - of course, in addition to the main agricultural activity - and, thereby, ensure the sustainability of the socio-economic state of the rural region.According to a number of experts, this approach has long been an established practice in many countries, as there is a growing demand among urban residents for outdoor recreation in rural destinations. In particular, we can refer to expert estimates of the quantitative expression of the factors that determine the population's needs for recreation in rural areas: for example, urbanization problems form 30% of the demand for such recreation; environmental pollution is 25%; inaccessibility of funds for expensive resort vacations is 21%; the established habit of recreation in rural areas is 10%; the need to become familiar with rural traditions and customs is 8%; and, finally, the degree of accessibility and closeness to natural nature is 6% of demand.

Global practice generally demonstrates that agrotourism, in the form of small family hotels, serves as a crucial program to transition rural populations not involved in agricultural production into the service sector. This successful implementation of agrotourism stems from the national level's implementation of a comprehensive socio-economic strategy that supports rural regions (Podgorskaya et al. 2021).

3.2 Systematic approach to regulating internal migration

Based on the literature review, all the proposals in the research of scientists are heterogeneous in nature and are not always related to each other. Given this, developing an effective mechanism for regulating internal migration requires a comprehensive and systematic approach. We have proposed a diagram of such an approach (Figure 1).



Note: developed by the research authors

Figure 1. Systematic approach to regulating internal migration

The proposed scheme serves as a basis for assessing the feasibility of adjusting migration policy.
The research authors processed data on the internal migration balance for the period 2015-2022. Indicators of migration attractiveness in, the regions of Kazakhstan were calculated (Table 3), according to which, by 2022, in 13 regions of Kazakhstan the level of attractiveness was below, which is evidence of negative processes in the life of the regions.

Table 3. Dynamics of changes in the coefficients of internal migration attractiveness of the regions of Kazakhstan

Regions	2015	2016	2017	2018	2019	2020	2021	2022
Akmola	1,05	0,77	1,03	0,95	0,95	0,95	0,94	0,96
Aktobe	0,98	0,95	0,99	0,99	0,99	1	0,98	0,97
Almaty	0,94	0,97	0,97	0,91	0,92	0,93	0,97	1,02
Atyrau	1	0,99	1	0,99	0,97	0,97	0,94	0,95

Regions	2015	2016	2017	2018	2019	2020	2021	2022
West-Kazakhstan	1,01	0,95	0,98	0,99	0,98	0,97	0,94	0,94
Zhambyl	0,89	0,72	0,8	0,87	0,89	0,89	0,89	0,89
Karaganda	0,99	0,91	0,94	0,92	0,95	0,94	0,92	0,95
Kostanayskaya	1,02	0,93	0,97	0,99	0,98	0,96	0,94	0,94
Kyzylorda	0,95	0,88	0,93	0,95	0,94	0,92	0,9	0,94
Mangystau	1,01	0,91	1	1	1,02	1,01	1	0,99
Pavlodar	1,01	0,94	0,95	0,98	0,99	0,97	0,95	0,94
North-Kazakhstan	0,96	0,88	0,94	0,96	0,95	0,93	0,91	0,9
Turkestan	0,95	0,81	0,8	0,85	0,95	0,9	0,86	0,91
East-Kazakhstan	0,96	0,87	0,93	0,94	0,92	0,9	0,9	0,98
Astana city	0,98	1,53	1,16	1,13	1,13	1,13	1,15	1,17
Almaty city	1,2	1,2	1,17	1,2	1,2	1,22	1,15	1,18
Shymkent city	-	-	1,17	1,25	1,03	1,1	1,1	1,02

Note: calculated by the research author

At the same time, it seems to us that such a methodological approach aimed at identifying quantitative assessments of one or another attractiveness of regions does not create the necessary basis for making more significant decisions in terms of the formation and adoption of measures to manage internal migration.

In our opinion, *estimates* of the internal migration factor's real economic efficiency *are necessary*.

To assess such an influence, we propose to use a factorial economic and mathematical model. This model establishes the dependence of the gross regional product indicator on the indicator of the attractiveness of the region, given in Table 3. As an experimental comparative analysis, we will consider the Zhambyl region, characterized by the lowest indicator values during the calculation period, and the Almaty region, which has the highest indicator among the regions, excluding three megacities for experiment purity.

Carrying out a special data processing program using the least squares method allows us to derive the following model for the Zhambyl region:

GRP = 1,029 – 0,426 IMP +0, 23 t, (2)

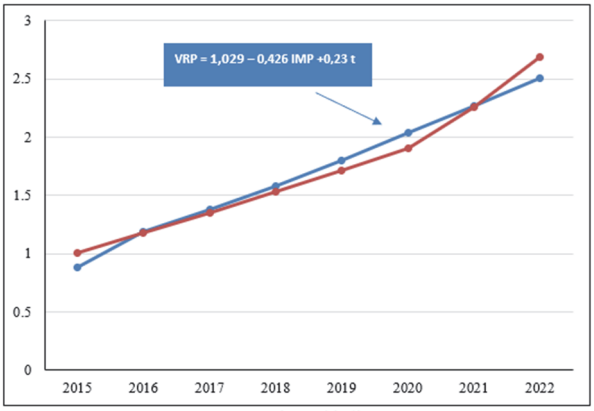
where GRP is gross regional product, trillion tenge;

IMP – index of migration attractiveness;

and t – time factor.

The coefficient of standard deviation indicates a high degree of approximation properties in the model.

The calculated model's coefficient of standard deviation from the real data is R2 = 0.96, indicating a high degree of approximation properties in the calculated model. The diagram in Figure 2 clearly demonstrates this.



Note: compiled by the research author.

Figure 2. Graphic illustration approximation properties of the model (2)

Analysis of the parameters of the derived model shows that the elasticity coefficient for the migration attractiveness index is

E = - 0.213, and this means that with an increase in the index value by 1%, the volume of regional GRP will decrease by 0.213%.

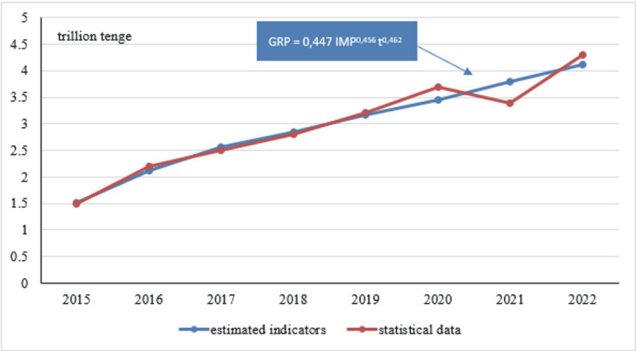
Specifically, using data from 2022, we can observe that a 1% increase in the migration attractiveness index, from 0.89 to 0.899, could potentially result in a 5.7 billion tenge decrease in the gross regional product of the Zhambyl region.

This picture, in our opinion, may be associated with the low level of "provision" of internal migrants with living standard factors, meaning the availability of housing, social security, and employment. In other words, increasing the attractiveness indicator does not lead to the desired economic effect.

Similar calculations made it possible to identify the best factor model for the Almaty region:

$GRP = 1{,}447\ IMP^{0{,}456}\ t^{0{,}462}$ (3)

The coefficient of standard deviation of the calculated data from the real data is also R2 = 0.96, and it indicates a high degree of approximation properties of the model. This is clearly evidenced by the diagram shown in Figure 3.



Note: compiled by the research author

Figure 3. Graphic illustration of the approximation properties of the model (3)

Analysis of the parameters of the derived model shows that the elasticity coefficient for the migration attractiveness index is E = 0.456, and this means that with an increase in the index value by 1%, the volume of GRP will increase by 0.456%.

Using data from 2022, we can observe that a 1% increase in the migration attractiveness index, from 1.02 to 1.03, could potentially lead to a 44 billion tenge increase in the Almaty region's gross regional product volume. This means that the region has a positive potential for factors and conditions for internal migrants.

As we see, internal migration has significant potential, and in the absence of an effective mechanism for regulating these processes, they can have a significant negative impact on the economic development of regions and, accordingly, on the economic potential for solving local social problems.

4. Discussion

This research is a concise summary of the main findings obtained from the data analysis of the National Bureau of Statistics, covering the period from 2015 to 2023, and the calculation results of the factorial economic and mathematical model.

Thereby, the empirical evidence confirms that (1) the migration attractiveness index may have an impact on the volume of GRP, (2) estimates of the internal migration factor's real economic efficiency are crucial for proper migration regulation, and (3) building migration capacity may lead to the economic effects.

Overall, the key points derived from the research can be described as follows:

1. The literature research results demonstrate that migratory factors are categorized into three broad levels, which are micro-, meso-, and macro-levels. The factors and causes of migration could be various, although a major portion of researchers attribute them to socio-economic issues. It could be unemployment, inadequate salaries, limited educational opportunities, housing challenges, or even environmental concerns. Therefore, we observed that socio-economic factors have a crucial role in determining migration patterns. Further, the empirical evidence we have gathered during the research has reinforced our arguments.
2. Subsequently, a thorough examination of regulatory documents and the current state of migration processes in Kazakhstan was conducted. It is essential to mention the following. Although legislative regulation dates back 25 years, there are still gaps to this day. In particular, the correct approach to the development of regulatory measures requires high-quality scientific research and mathematical calculations for analysis and forecasting. Regarding the current state of migration processes, it ought to be highlighted that a significant part of migration is associated with the relocation of the rural population to large cities. Government support measures for both migration and the development of rural communities are crucial in this context. Regarding this matter, we believe that the most crucial aspect of the organizational measures system should focus on enhancing legislation concerning local self-government. This will effectively strengthen local budgets and consequently expand the scope of local capabilities to address urgent issues related to internal migration.
3. Based on the literature review findings, a systematic approach for regulating migration processes in Kazakhstan has been suggested. This strategy includes the following:

- differentiation of measures based on macro-, meso-, and micro levels;
- consolidation of government measures in the areas of social security, financial and legal support;
- mandatory monitoring and evaluation of results.

Furthermore, we conducted mathematical analysis using statistical data from 2015 to 2022 using the economic and mathematical model we proposed. As a result, we have identified a correlation between indicators of the region's attractiveness and the volumes of gross regional product.

According to the research results, it is important to address the concerning trends in the internal migration of the population. These trends have a direct impact on the country's economic and social development, leading to undesirable consequences.

To mitigate these adverse trends, it is essential to achieve consistency in developing strategies that effectively regulate internal migration in Kazakhstan.

5. Conclusion

To sum up, migration is a significant and vital phenomenon in the global economy. As a result, we classified migration regulatory measures into three distinct categories: macro-, meso-, and micro-levels. Each category exerts a unique impact on the overall migration process.

The study analyzes the current trends of migration processes on the regional gross product. Based on the influence model obtained, an assessment of the effect of migration on the socio-economic status of the region is shown.

Empirical evidence confirms that the migration attractiveness index may influence GRP The evaluation of the real economic effectiveness of the internal migration factor is crucial for proper management of migration and the potential of migration can contribute to the corresponding economic consequences.

We reveal key determinants that exert a significant impact on gross regional product, which is the attractiveness of a region. We use our systematic approach to create a cohesive picture of the regulation measures as a whole. The results of the study can be used in the development of policies to regulate migration processes within the country. In addition, activities can be designed for a specific region taking into account its socio-economic situation and migration balance. The research results allow us to conclude that migration is of particular importance.

Further studies can be directed to the prediction of changes in migration processes influenced by socio-economic factors.

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