

## Education as an Economic Instrument of Internal Migration Regulation in Kazakhstan: Analysis and Evaluation of State Initiatives

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### Abstract

This study is dedicated to analyzing and evaluating government initiatives aimed at addressing migration challenges in Kazakhstan that manifest in uneven migration flows and significant disparities in population density between the southern and northern regions. The authors assess the implementation of a state program as part of their analysis, which, through an educational initiative in the form of grants and other support for young people, was intended to promote population migration from the densely populated southern regions to the northern and central regions, where a systematic outflow of the population has been observed. The paper's objective is to assess the effectiveness and evaluate the impact of the state initiative known as "Serpin-2050" by employing the Difference-in-Differences (DID) method, which allows for the assessment of changes in migration flows before and after the introduction of this initiative, as well as across the regions participating in the program. The findings of this study indicate that, despite the allocated funding, the implementation of the program has not been effective. Specifically, certain key indicators related to increasing population inflow to the northern and central regions have not been achieved. Participants of the "Serpin-2050" program struggled to adapt to the northern regions and eventually returned to their previous places of residence. As a result, the problem of demographic imbalances between the northern and southern regions remains unresolved.

**Keywords:** *internal migration, government policy, effectiveness assessment, educational grants.*

### Introduction

Managing internal migration processes is a crucial aspect that significantly influences economic and social development, as the efficient allocation of labor resources can substantially enhance a

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country's economic performance (Castles et al., 2013; Todaro & Smith, 2012). The movement of the labor force from regions with low economic development to more promising areas facilitates the optimization of resource distribution and stimulates economic growth (Glaeser & Gottlieb, 2009; Krugman, 1991). However, economic structures, labor market conditions, and geographical disparities all affect migratory patterns, which are highly context-dependent (Dustmann & Görlach, 2016). Addressing these challenges effectively is a key responsibility of modern governments.

For example, in China, internal migration is primarily driven by labor: most internal migrants move to the country's most developed regions in search of employment opportunities. A common explanation for the economic prosperity of China's industrial centers is the influx of domestic labor migrants, especially in coastal areas such as Shenzhen and Shanghai (Wang et al., 2023). According to the National Migration Administration of China, the number of internal migrants in the country has reached 247 million, accounting for 18% of the total population. Approximately 75% of these migrants reside in the most developed provinces in eastern China ("Zhen'min' zhibao" 2016).

In developed countries, governments aim to stimulate internal migration flows in economically justified directions. For example, in the United States, regional income taxes are actively used as a tool for managing migration processes. Some states without state income tax, such as Alaska and South Dakota, use tax incentives to counteract population outflows. Meanwhile, Wyoming focuses on attracting labor migrants, while Florida targets wealthy retirees. Wyoming, the least populous state in the United States, pursues a targeted migration policy by offering tax incentives, including a no-state income tax and lower personal tax rates. Additionally, the state provides housing assistance programs for migrants (Bennhold, 2021). In a similar vein, Canada has implemented targeted immigration policies, such as the Provincial Nominee Program (PNP), which helps reduce economic disparities across provinces by directing migrants to areas with labor shortages (Houle & Schellenberg, 2010). Demographic conditions serve as a fundamental determinant influencing the socio-economic life and development of a region (Bloom et al., 2003). Adaptive migration policies are necessary to balance labor supply and demand in response to factors such as uneven regional development, aging populations, and rapid urbanization (OECD, 2021). The selection and implementation of effective tools for managing migration processes can act as a catalyst for such development (Fitzgerald & O'Reilly, 2018; OECD, 2015).

In Kazakhstan, the issue of uneven internal migration flows is becoming increasingly urgent. According to demographic forecasts, by 2050, approximately one-third of Kazakhstan's population is expected to reside in megacities such as Astana and Almaty, while many regions, particularly peripheral areas, are anticipated to experience significant population decline (Kasenov & Nurmagambetov, 2017). Similar findings are supported by reports from the Ministry of National Economy of Kazakhstan (2020) and the World Urbanization Prospects, 2018 Revision, published by the United Nations Department of Economic and Social Affairs (2018). Recent trends show that migration from rural to urban areas is accelerating, exacerbating labor shortages in some industries, such as industrial and agricultural production in northern Kazakhstan (World Bank, 2024). Researchers suggest that various factors influence internal migration, including language policy, education policy, regional economic development, as well as the importance of fair pay, good working conditions, and other factors (Agyare, 2025; Bokayev et al., 2012; Ngcobo & Magadla-Mateyise, 2025).

Thus, the development and evaluation of state programs in migration policy remain a pressing issue. The objective of this article is to assess the effectiveness of government educational programs aimed at regulating internal migration flows within the country. A primary focus will be to analyze whether educational programs alone can address labor imbalances or if they need to be combined with more extensive economic and infrastructure investments.

### **Literature Review**

The use of education as an economic tool for regulating migration draws on both classical and modern theories of human capital, initially proposed by Gary Becker (1964). Becker demonstrated that education is a key form of investment in human capital, enhancing labor productivity and stimulating regional economic development. From an economic theory perspective, improving access to education in regions with low migration appeal can help reduce migration flows to large cities by increasing local employment and income levels. However, research suggests that for education-based migration plans to succeed, they must be paired with job opportunities (Hanushek & Woessmann, 2020; OECD, 2021).

Other scholars, such as Schultz (1981) and Psacharopoulos (1994), emphasized that education acts as a social equalizer, helping to reduce economic and social disparities between regions. The level of human capital, in which education plays a central role, can either attract or repel populations

and migrants. Moretti (2012) highlights how the concentration of highly educated workers influences internal migration and urban economic development. Additionally, knowledge-based economies encourage migration to innovation hubs, which can exacerbate regional inequality (Florida, 2002; Green & Owen, 2003).

George Borjas (1992) argues that highly educated individuals are more likely to migrate to regions with better economic prospects, where their qualifications are in high demand. Card (2001) examines how highly educated migrants impact labor markets and contribute to internal migration flows. Similarly, the work of other researchers (Bokayev, 2023; Bokayev et al., 2020; McCorkle & Montezuma, 2022; Tamang & Shrestha, 2021) supports this idea, emphasizing the importance of education as a key driver of migration. Recent studies on European migration policies also suggest that targeted education initiatives can help mitigate regional brain drain. The European Commission (2023), for example, notes how Erasmus+ and Horizon Europe have successfully reduced migration gaps by promoting educational mobility without resulting in the permanent loss of talent.

In Kazakhstan, similar goals are pursued through programs such as “Serpín-2050,” which seeks to attract young people from the densely populated southern regions to the northern and central parts of the country. However, a thorough evaluation of the program’s effectiveness requires a comprehensive analysis. Research in this area remains limited, underscoring the relevance of this study. While Serpín-2050 has increased student enrollment in northern regions, some studies suggest that graduates still face challenges in finding employment, leading to secondary migration after graduation (Bezhkenov, 2022a; James-Aguh & Takenov, 2024).

Internal migration is explained by the *theory of spatial economics* (Krugman, 1991), which attributes migration to unequal resource distribution, including access to education. Research indicates that migratory patterns are significantly influenced by educational infrastructure (Gennaioli et al., 2013). In Kazakhstan, young people are leaving places lacking access to high-quality higher and vocational education due to the stark contrast in educational opportunities between urban and rural areas (Sekerbayeva et al., 2024; Turgumbayeva et al., 2023).

Additional insights into internal migration processes can be gained from *the push-pull migration hypothesis* (Lee, 1966). According to this framework, migration decisions are influenced by a combination of pull factors—such as job opportunities, better infrastructure, and higher educational attainment in the receiving regions—and push factors—such as unemployment, low

educational attainment, and unfavorable living conditions in the sending regions. The goal of Kazakhstan's "Serpin-2050" project is to expand access to education, creating pull factors in the northern and central parts of the country (Aldashev, 2011). However, other studies have shown that if additional pull factors, such as housing and economic opportunities, are not sufficiently developed, migration plans may fail to achieve long-term population redistribution (Castles et al., 2013).

Furthermore, migration is often a household strategy rather than a personal choice, according to *the New Economics of Labor Migration (NELM)* framework (Stark & Bloom, 1985). Families may choose to send a family member to study in a different location to improve household income. However, if the economic benefits of migration remain uncertain, return migration is likely. The NELM framework suggests that many students in the "Serpin-2050" program relocate for education but later return home due to a lack of job opportunities.

*The dual labor market theory* (Piore, 1979) offers an additional rationale for the potential failure of education-based migration efforts. According to this theory, labor markets in industrialized areas are often divided into primary (high-paying, stable jobs) and secondary (low-paying, unstable jobs) sectors (Field, 2009; Finnie, 2004). Even though educational programs like "Serpin-2050" are designed to attract trained professionals to labor-deficit areas, graduates may need to seek employment elsewhere if there are insufficient primary-sector job openings in Kazakhstan's northern and central regions. Glaeser and Gottlieb (2009) argue that the integration of urban and economic policies is essential for successful worker redistribution.

A comparative study of regional migration strategies in Scandinavian countries found that the establishment of regional educational institutions and improved access to vocational education programs significantly reduced migration from rural areas (Hägglund, 2006; Bound, 2007). Vocational training has been shown to help retain skilled individuals in underserved areas when it aligns with local economic needs (Brücker et al., 2019). This supports the argument that migration policies driven by education must ultimately be complemented by more comprehensive labor market strategies, infrastructure expenditures, and regional economic development (World Bank, 2019).

Together, these findings suggest that while education can influence migration patterns, its impact is limited unless supported by broader labor market structures, social policies, and economic

incentives. This study will evaluate Kazakhstan's strategy in the context of global best practices and identify areas where policy improvements are needed.

### **Research Objective**

This study examines the "Serpín-2050" state program, which aims to redirect migration flows of young people (students) from densely populated regions to less populated areas (Kazakhstanskaya Pravda, 2022). As part of this program, educational grants have been allocated for studies in colleges and universities. The program was launched in 2014, and over a span of more than ten years, it is now possible to assess its implementation and impact on migration (Bezhkenov, 2022b; Bodaukhan, 2019).

Although several other state migration programs exist, this particular program is most closely associated with both education and migration, making it the primary focus of this research (Islyami, 2020).

The primary objective of this study is to conduct a scientifically grounded and statistically supported assessment of the "Serpín-2050" state program, evaluating its impact on migration processes and determining whether an educational program can effectively serve as a tool for regulating migration.

### **Research Questions:**

1. Has the inflow of population to labor-deficit regions (northern and central Kazakhstan) increased following the implementation of the state program?
2. Has the intensity of migration from densely populated southern regions of Kazakhstan increased after the introduction of the state program?
3. To what extent have migration flows changed after the implementation of the state program?
4. Has this state program successfully addressed demographic imbalances in the participating regions?

### **Method**

This study adopts a mixed-methods research approach, combining quantitative and econometric techniques to examine internal migration patterns in Kazakhstan and assess the impact of the "Serpín-2050" state program. Additionally, content analysis is applied to evaluate the substance of government programs.

## **Data Collection Tools**

All primary data were obtained from the Bureau of National Statistics of Kazakhstan, accessible via its official website (Bureau of National Statistics, 2024). The dataset includes regional demographic statistics, migration flows, and population changes across all administrative divisions of Kazakhstan.

Data were gathered for each district, including:

- Total migration balance,
- Number of people emigrating from the region,
- Number of people immigrating to the region.

Statistical data from 2009 to 2023 were used for analysis. In some regions, earlier data were unavailable, so this period was selected to maintain consistency across all regions. Additionally, 2009 was chosen as the starting year due to the national census, which provided a comprehensive dataset on Kazakhstan's demographic situation.

For further calculations, the ratio of outgoing or incoming population relative to the total population of a given region for each specific year was estimated. Regional population data by year were extracted from the Bureau of Statistics' dynamic tables: "Population Size (by years)" (<https://stat.gov.kz/ru/industries/social-statistics/demography/dynamic-tables/>).

All data were initially extracted into Excel (.xls format) and then processed using Python (Jupyter Notebook) for faster calculations and model analysis.

## **Instruments**

To test the research hypothesis, an econometric model was employed: Difference-in-Differences (DID) (Abadie, 2005). This standard DID model is used to assess the impact of an event before and after its implementation, allowing researchers to statistically measure the effect of a policy intervention.

Using this model, the impact of the educational program on migration was evaluated by treating:  
Regions with the program as the treatment group,  
Regions without the program as the control group.

The model assesses migration patterns both before and after introduction of the program.

For this study, the "Serpín-2050" state program was selected as the policy intervention of interest. The standard Difference-in-Differences (DID) regression model is represented as follows:

$$Y_{it} = \beta_0 + \beta_1 \text{Program}_i + \beta_2 \text{Post}_t + \beta_3 (\text{Program}_i \times \text{Post}_t) + \epsilon_{it}$$

where:

$Y_{it}$  — Migration rate in region  $i$  at time  $t$ ;

$\text{Program}_i$  — Binary variable (1 if the region participates in the program, 0 if otherwise);

$\text{Post}_t$  — Binary variable (1 for years 2014 and later, 0 for years before 2014). Since the "Serpín-2050" program was officially launched in 2014, and the first wave of students started in the 2014/2015 academic year, the year 2014 is used as the threshold year ( $\text{Post}=1$ ) in the DID model;

$\text{Program}_i \times \text{Post}_t$  — Interaction term (the key coefficient  $\beta_3$  captures the effect of the program);

$\epsilon_{it}$  — Error term of the model.

Interpretation of coefficients:

$\beta_1$  (Program): Measures the difference in migration levels before the program was introduced between participating and control regions.

$\beta_2$  (Post): Captures the general change in migration levels after the program implementation, regardless of regional participation.

$\beta_3$  (Program  $\times$  Post): The key coefficient of interest, which measures the difference in migration levels before and after the program between participating and control regions. If significant, this coefficient indicates a real effect of the program on migration trends.

### Validation of instruments

If  $\beta_3 > 0$  and statistically significant, this indicates that the program had a measurable impact on migration levels by increasing migration inflow to participating regions.

If  $\beta_3$  is not significant or  $< 0$ : this suggests that the program did not have a statistically significant effect on migration flows to participating regions.

**Table 1**

To estimate the model, the following variables were used:

Variable	Description
year	Year of observation
region	Name of the region
population	Population size of the region
in_migration	Number of migrants who moved into the region
out_migration	Number of migrants who moved out of the region
in_migration_rate	Migration inflow per 1,000 inhabitants
Program	1 if the region participates in the "Serpín-2050" program, 0 if otherwise
Post	1 for 2014 and later, 0 for years before 2014
Interaction (Program × Post)	Interaction term capturing the effect of the program on migration
Sender	1 for regions expected to send migrants (Almaty, Turkestan, Zhambyl, Kyzylorda, Mangystau), 0 otherwise
Interaction (Sender × Post)	Interaction term capturing changes in out-migration from southern regions after the launch of the program

Initially, the standard DID model considered only receiving regions, evaluating their migration inflow after the policy intervention. However, since the "Serpín-2050" program also aimed to increase out-migration from overpopulated southern regions, a new variable was introduced:

*Sender* – Identifies regions expected to send migrants, specifically the southern regions with a labor surplus.

*Sender*×*Post* – Interaction term, capturing whether out-migration from southern regions increased after the program's implementation.

This adjustment enhances the model's accuracy by allowing an evaluation of both the inflow of migrants into northern regions and the outflow from overpopulated southern regions, aligning with the dual objectives of the policy.

All econometric calculations were performed using Python within the Jupyter Notebook environment. The dataset was first processed in Excel, and migration trends were then analyzed using Python to ensure efficient and precise computations.

By incorporating both inflow and outflow migration effects, this extended DID model provides a more comprehensive evaluation of whether the "Serpín-2050" program achieved its intended impact on internal migration in Kazakhstan.

### **Limitation**

The Difference-in-Differences (DID) method assumes that the difference between regions with and without the program is solely due to the introduction of the program. However, in reality, migration trends can be influenced by other economic and social factors, such as:

- Unemployment rates and job availability in regions;
- Government support programs for small businesses and infrastructure projects;
- Natural and climatic conditions (e.g., the harsh climate of northern regions may discourage migration).

If these factors vary significantly between regions, their influence could distort the DID results, making it challenging to isolate the true effect of the program.

### **Violation of the Parallel Trends Assumption**

The DID method relies on the assumption that migration trends in both treatment and control regions were parallel before the program was introduced. If trends diverged before 2014, the differences observed after the program's implementation might be attributed to pre-existing migration dynamics rather than the program itself. For example, northern regions may have already been experiencing population decline, while southern regions might have naturally exhibited migration growth due to high birth rates and economic expansion. This raises a risk that the estimated program effect could be underestimated if migration would have declined even further without the program. Conversely, the effect may be overestimated if migration trends had already been increasing before 2014.

The DID method also assumes that statistical data are reliable and complete. However, in practice:

- Not all migrants officially register their change of residence, which may lead to underreporting of migration flows.
- Migration data may fail to distinguish between labor migration and forced migration (e.g., due to climate conditions or family circumstances).

Such inconsistencies in data quality could distort the results of the DID analysis, potentially leading to an overestimation or underestimation of the program's effect.

The DID analysis is designed to evaluate the average effect of the program immediately after its implementation. However:

– The "Serpín-2050" program may not have produced immediate results, as students take several years to complete their education, and their subsequent employment in receiving regions may be delayed.

– A more accurate evaluation would require data spanning a longer period, extending beyond the initial years of program implementation.

Alternative econometric approaches, such as dynamic panel data models, could offer a more nuanced understanding of the program's long-term impacts.

While DID is a robust method for policy evaluation, its application to the "Serpín-2050" program has several limitations due to pre-existing demographic trends, data reliability issues, and time-lagged effects. To address these challenges, supplementary methods may be necessary, including:

– Including economic control variables (e.g., employment rates, wages, infrastructure development);

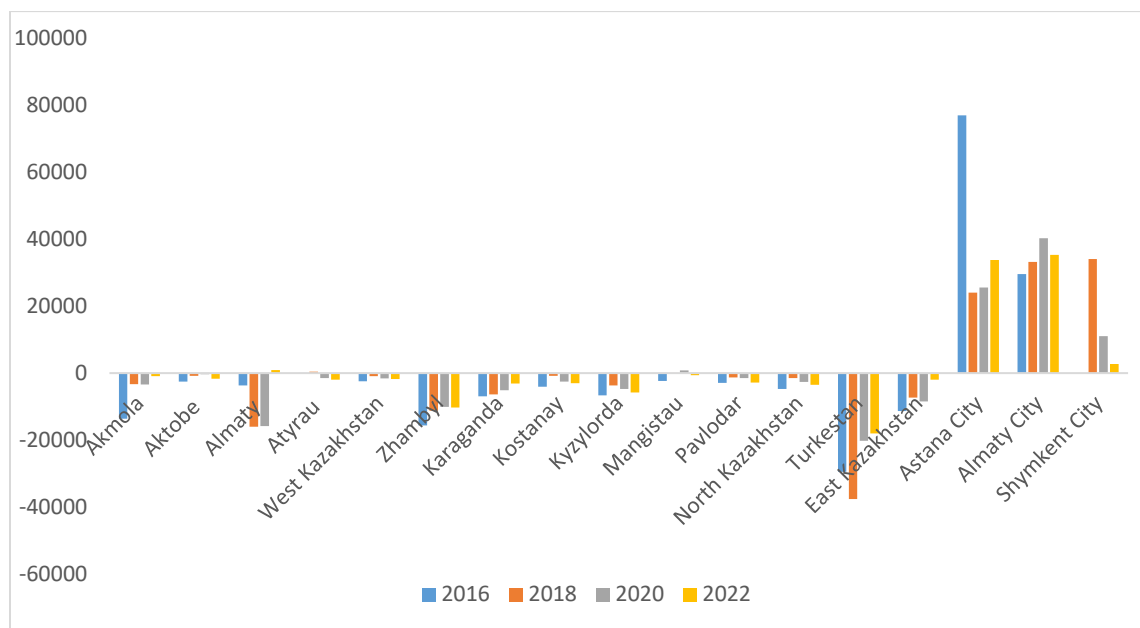
– Using dynamic panel models to track long-term migration patterns;

– Conducting robustness checks (e.g., placebo tests and sensitivity analyses).

These additional approaches would strengthen the analysis and provide a more comprehensive assessment of whether education-based policies can effectively regulate internal migration in Kazakhstan.

### **Findings**

Internal migration significantly influences the demographic composition of various regions. In some areas, it may contribute to population growth, while in others, it can result in a decline. Approaches to migration regulation must account for these demographic shifts and anticipate their potential impact on regional development. An important tool in this area is the collection and analysis of migration data, which helps identify trends and inform the design of appropriate programs and interventions. It is essential to have flexible policies that can adapt to demographic changes, ensuring the sustainable development of regions. Figure 1 presents an analysis of interregional differences in migration processes within the Republic of Kazakhstan.



**Figure 1. Internal migration balance in the regions of Kazakhstan**

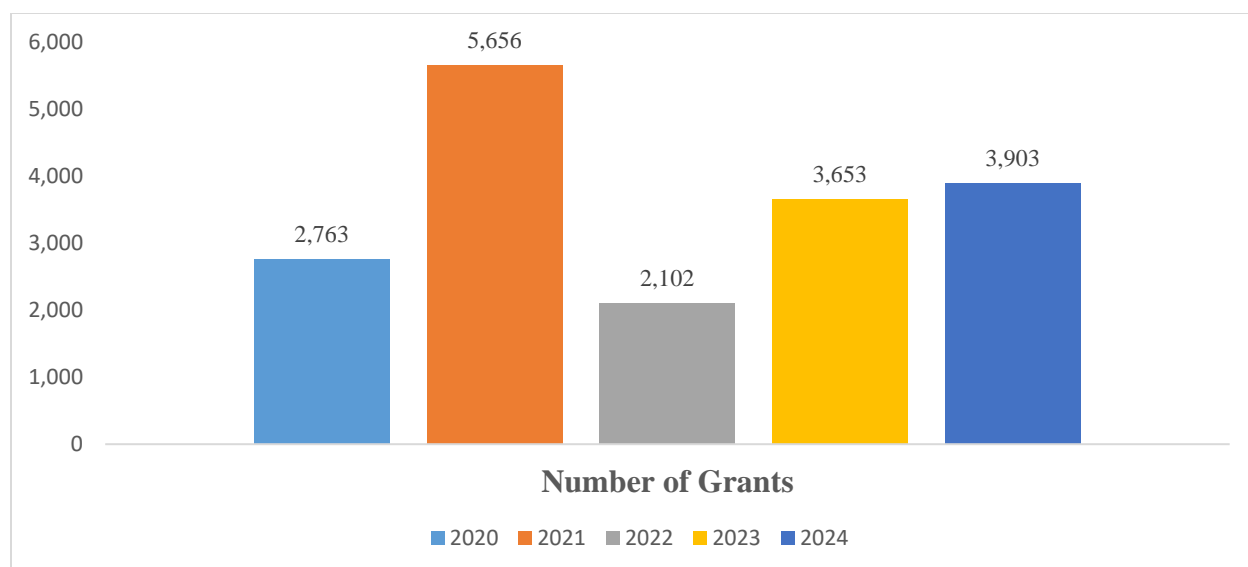
The "Serpin" program is a central role in the internal migration strategy implemented by the Government of Kazakhstan. The program aims to facilitate migration from densely populated southern regions to northern and eastern areas. To achieve this, the state budget allocates funds for both educational grants for students and relocation assistance for families, including employment opportunities (Kazakhstanskaya Pravda, 2022).

The primary objective of the program is to train and employ young people from southern regions of Kazakhstan—namely, the Almaty, South Kazakhstan (now Turkestan), Zhambyl, Kyzylorda, and Mangystau—where labor surpluses exist. These students are then expected to relocate to the eastern, northern, and western parts of Kazakhstan where there is a shortage of skilled workers.

#### Eligibility and Grant Allocation

The program targets graduates of rural schools in the southern regions of Kazakhstan. Higher education grants are distributed to universities in the central, northern, and eastern regions.

Over the past five years, the Kazakhstani government has awarded approximately 18,077 educational grants under the "Serpin" program to students from the southern regions (Kazakhstanskaya Pravda, 2022). The annual distribution of these grants is shown in Figure 2.



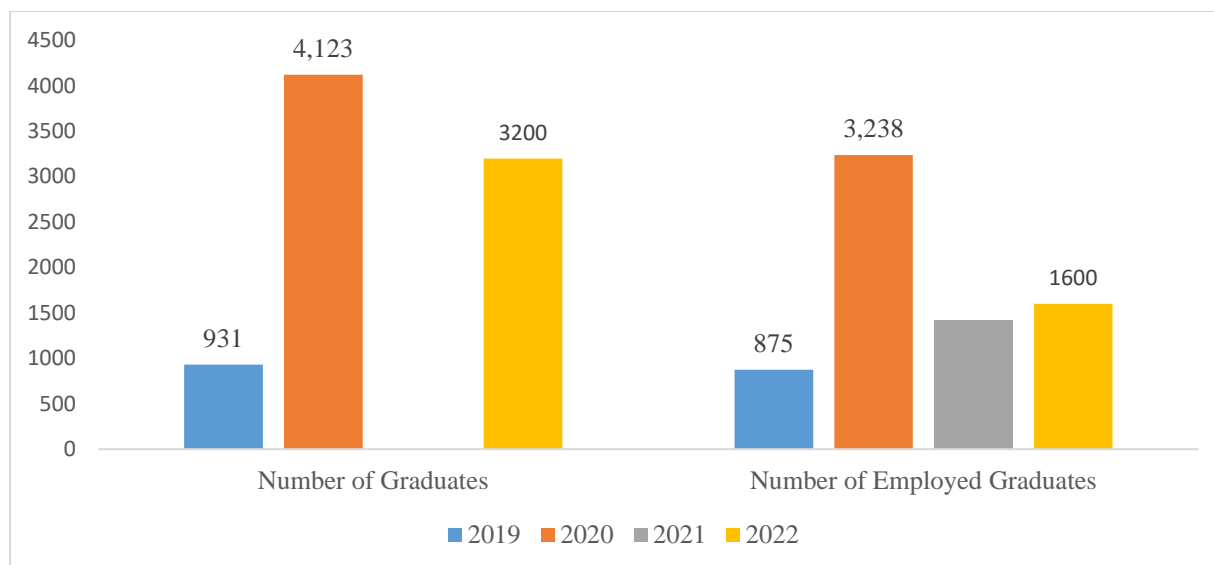
**Figure 2. Number of Grants Allocated for the Period 2020–2024**

Compiled by the author based on the source (Committee of Labor and Social Protection)

It is important to note that the implementation of this program has been largely ineffective, as students who receive grants complete their education but fail to fulfill the legally required employment period in the designated regions. According to data from the authorized body, of the approximately 8,900 program participants who graduated from universities by 2020, about 3,200 thousand individuals (or 35.8%) did not fulfill the required three-year work obligation and returned to their places of residence (ranking.kz, 2022).

In response, the government has introduced several support measures for young professionals, such as relocation allowances and housing assistance, which have helped reduce the percentage of reverse migration among graduates.

In 2022, a total of 3,200 students graduated, with 1,600 (50%) securing employment at graduation (kyzylorda-news.kz). The trend for the period 2019–2022 is illustrated in Figure 3.



**Figure 3. Number of Graduates and Employed Graduates for the Period 2019–2023**

Compiled by the author based on the source (Committee of Labor and Social Protection)

Despite these efforts, the percentage of graduates who completed their education under the state program, obtained a diploma, and remained in the northern regions remains minimal. One key issue is the difficulty in providing housing for young professionals, as local executive authorities are unable to accommodate all graduates of the "Serpín" program. Additionally, challenges sometimes arise in securing employment for specialists.

The "Serpín-2050" program is designed to address labor shortages in the northern and central regions of Kazakhstan by redistributing youth from the densely populated southern regions. "The Serpín program is part of the adopted strategy of the Government's internal migration policy. It assumes that people will move from densely populated southern regions to northern and eastern regions. For this purpose, money is allocated from the budget for grants for applicants, and for the resettlement of families, their employment" (Ranking.kz. 2024). More specifically, the goal of the program is to train and employ young people from regions in southern Kazakhstan (Almaty, South Kazakhstan, Zhambyl, Kyzylorda, Mangistau regions), which have surplus labor, in the eastern, northern and central regions of Kazakhstan, which face labor shortages. Graduates from rural schools in the southern regions are eligible for the program. Educational grants are provided for universities in the target regions, including Kostanay, Akmola, East Kazakhstan, North Kazakhstan, Pavlodar, Karaganda regions, as well as the Abay and Ulytau regions. Over the past

five years, the state has allocated about 18,077 grants for students from southern regions as part of the implementation of the “Serpin” program (Kazakhstanskaya Pravda, 2020).

Receiving Regions (Northern and Central Kazakhstan)

The receiving regions (areas designated for attracting migrants) include:

- Akmola Region
- Kostanay Region
- North Kazakhstan Region
- Pavlodar Region
- East Kazakhstan Region
- Karaganda Region

Sending Regions (High Population Density Areas)

The sending regions (areas with high population density and labor surpluses) include:

- Almaty Region
- Zhambyl Region
- Turkestan Region
- Kyzylorda Region
- Mangystau Region

Results and Findings from Model Calculations

1. Difference-in-Differences (DID) Analysis – Assessing the impact of the program on migrant inflow.

### **1. DID Analysis – Impact of the Program on Migrant Inflow (Table 2)**

Interaction\_Program = 0.79 (p = 0.814)

- The program may have had a slight effect on increasing migrant inflow, but this effect is not statistically significant. Since p-value > 0.05, we cannot conclude that the program had a meaningful impact on migration.

Program = -0.81 (p = 0.770)

- Before the program was implemented, participating regions had a slightly lower migration rate, but the difference is not statistically significant.

Post = 1.79 (p = 0.382)

- After 2014, the overall migration level increased, however, this growth cannot be attributed to the program.

Conclusion:

- The "Serpin-2050" program did not have a statistically significant effect on increasing migrant inflows to the northern and central regions.

**Table 2**

*Dependent variable: in\_migration\_rate (migrant inflow per 1,000 people).*

Variable	Coefficient	Std. Error	t-Statistic	p-Value	95% CI (Min)	95% CI (Max)
Intercept	5,35	1,69	3,17	0,002**	2,02	8,67
Program	-0,81	2,76	0,29	0,770	-6,23	4,62
Post	1,79	2,05	0,88	0,382	-2,24	5,83
Interaction_Program	<b>0,79</b>	3,36	0,24	0,814	-5,83	7,42

**2. DID Analysis – Impact of the Program on Migrant Outflow from Southern Regions (Table 3)**

Interpretation of Results – Impact of the Program on Migrant Outflow from Southern Regions

Interaction\_Sender = 2982.21 (p = 0.415)

The program may have contributed to an increase in out-migration from the southern regions, but as  $p > 0.05$ , this effect is not statistically significant.

Sender = 1271.99 (p = 0.670)

Before the program was implemented, the level of out-migration in the southern regions was slightly higher, but this effect is not statistically significant.

Post = 2399.12 (p = 0.129)

After 2014, out-migration increased by an average of 2,399 people, but it cannot be confirmed whether this was caused by the program.

**Table 3**

*Dependent variable: out\_migration (number of people who left the region).*

Variable	Coefficient	Std. Error	t-Statistic	p-Value	95% CI (Min)	95% CI (Max)
Interception	4330.34	1292.98	3.349	0.001**	1783.35	6877.33
Sender	1271.99	2986.01	0.426	0.670	-4610.02	7154.01
Post	2399.12	1573.77	1.524	0.129	-700.97	5499.22
Interaction_Sender	<b>2982.21</b>	3652.87	0.816	0.415	-4213.41	10,200.00

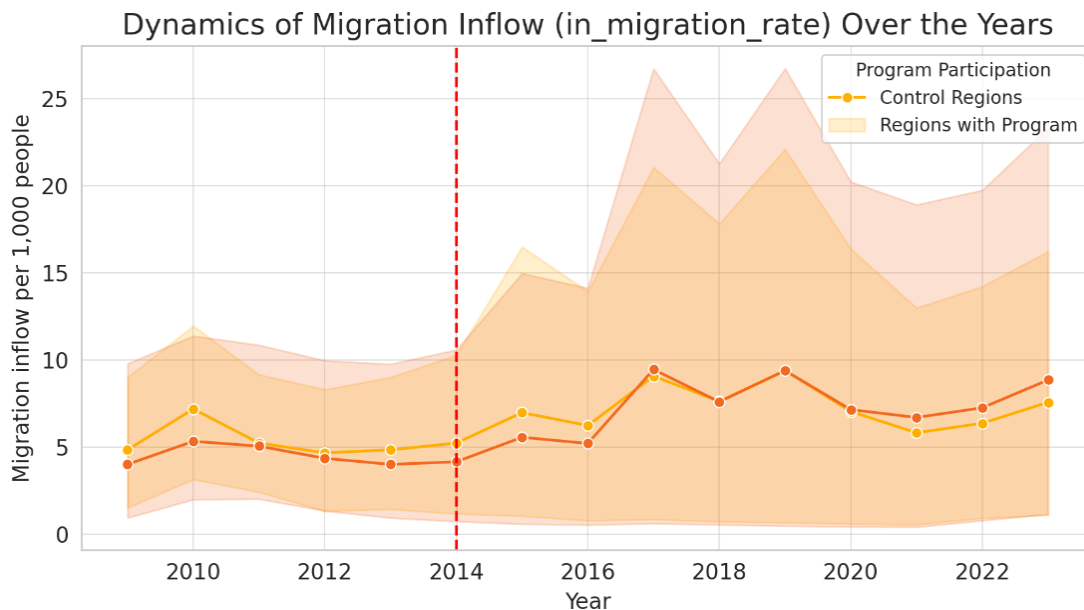
## Analysis of the Impact of the "Serpín-2050" Program on Internal Migration

This report presents an analysis of the impact of the 'Serpín-2050' educational program on internal migration flows in Kazakhstan. The Difference-in-Differences (DID) method was employed to compare migration trends in regions that participated in the program with those in control regions.

### 1. Migration Inflow Analysis

Figure 4 displays the dynamics of migration inflow rates over time. The red dashed line marks the commencement of the 'Serpín-2050' program in 2014.

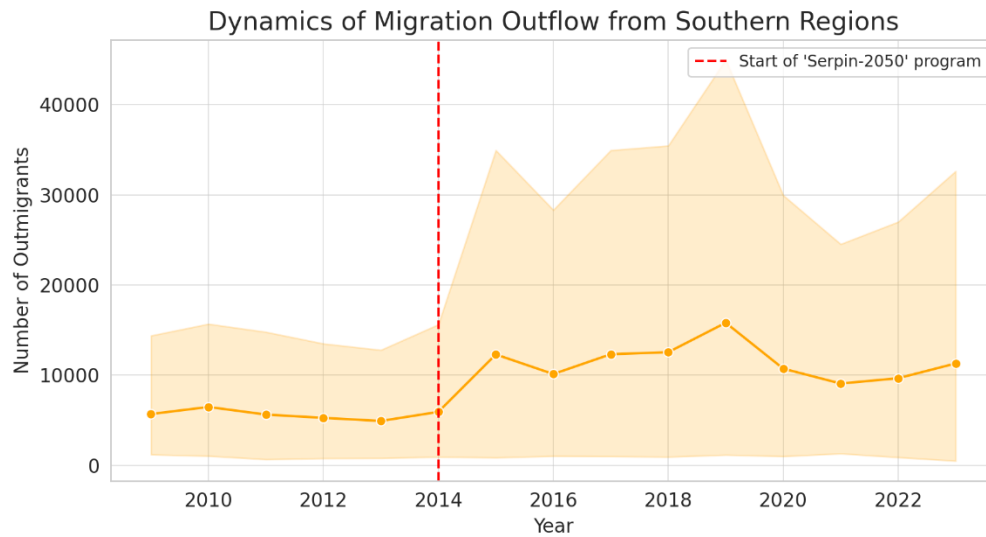
The analysis indicates that the migration inflow trend remained relatively stable both before and after 2014. There was no significant increase in migration inflows to the regions participating in the program, suggesting that the program did not have a substantial effect on attracting people to these areas.



*Figure 4. Dynamics of migration inflow (in\_migration\_rate) over time*

### 2. Migration Outflow Analysis

Figure 5 illustrates the migration outflow from southern regions before and after the program was launched. Although a slight increase in out-migration is visible, no abrupt change in trends is observed.



**Figure 5. Dynamics of migration outflow from Southern regions**

The data shows a gradual increase in migration outflows from southern regions after 2014, but the trend is not sudden. This suggests that while the program may have contributed to migration, other economic and social factors likely played a more prominent role.

The visualizations corroborate the findings from the regression analysis, confirming that the "Serpín-2050" program had a limited impact on migration patterns. Specifically:

The program did not significantly affect migration;

Out-migration from southern regions slightly increased, but there was no sharp surge;

Other economic factors, such as employment opportunities, income levels, and climate conditions, may play a more substantial role in shaping migration trends.

These findings imply that state educational initiatives alone may not be sufficient to drive large-scale internal migration. A comprehensive approach, integrating economic development policies, may be necessary to address regional labor imbalances.

### Discussion

The findings of this study suggest that the "Serpín-2050" program did not have a statistically significant effect on internal migration flows in Kazakhstan. The Difference-in-Differences (DID) analysis showed that the interaction coefficient (Interaction Program) was insignificant ( $p > 0.05$ ), indicating that the program had a minimal impact on increasing migration inflows to the labor-

deficient northern regions. Similarly, out-migration from densely populated southern regions did not experience a statistically significant increase ( $p = 0.415$ ).

From a theoretical standpoint, these results challenge the predictions of *human capital theory* (Becker, 1964; Schultz, 1981), which posits that individuals pursue education as an investment in their future productivity and mobility. If education were a strong driver of migration, we would expect a significant outflow of students from high-density regions to areas offering better educational and employment opportunities. However, our findings align more closely with *spatial equilibrium theory* (Glaeser & Gottlieb, 2009), which asserts that migration is influenced not only by education but also by economic opportunities, infrastructure, and living conditions. In Kazakhstan's case, although students relocated for education, they were not necessarily incentivized to stay in the northern regions after graduation.

Furthermore, *Borjas' (1992) self-selection model* explains why highly educated individuals tend to migrate to regions with better economic prospects. Since northern Kazakhstan does not offer competitive salaries or robust labor markets compared to urban centers in the south (e.g., Almaty), graduates of the "Serpin-2050" program might choose to return to their home regions. Krugman's (1991) theory of spatial economics, which emphasizes the importance of economic agglomeration and unequal resource distribution in shaping migrant flows, also lends support to this. The absence of strong economic hubs in northern Kazakhstan reduces its attractiveness, even with the provision of free education.

Furthermore, *the dual labor market theory* (Piore, 1979) suggests that migration decisions are influenced more by labor market conditions than by education alone. In Kazakhstan's case, while "Serpin-2050" provided scholarships and vocational training, it did not ensure job placement or career growth, which likely discouraged program participants from settling permanently in the receiving regions. Studies in Scandinavian countries (Hägglund, 2006) have shown that vocational education can reduce migration only if it is integrated with active labor market policies, such as guaranteed employment and housing incentives—factors that were insufficiently addressed in Kazakhstan's approach.

The limitations of this study should also be acknowledged. The DID analysis assumes parallel trends, meaning that migration trends in both treatment and control regions would have been similar in the absence of the program. However, regional disparities in economic development, climate conditions, and infrastructure may have violated this assumption.

Additionally, unregistered migration and secondary migration (graduates moving back to their home regions) may not be fully captured in official statistics. Given these constraints, further research should extend the analysis over a longer timeframe (10–15 years) and incorporate additional policy factors such as employment rates, housing conditions, and family migration patterns.

### **Conclusion**

Using the Difference-in-Differences (DID) method, this study assessed the impact of the "Serpin-2050" program on internal migration in Kazakhstan. The findings challenge the assumption that education-based migration programs can effectively transfer labor to disadvantaged areas, revealing that the program had no discernible effect on migration flows. Its long-term impact was limited, as while it offered educational opportunities, it did not offer sufficient employment incentives to retain graduates in the receiving regions.

The results suggest that, from a theoretical standpoint, both the dual labor market theory (Piore, 1979) and spatial economics theory (Krugman, 1991) highlight the inadequacy of capital accumulation in fostering migration. Instead, economic incentives, such as job availability, wages, and living conditions, appear to have a more significant influence on migration decisions than education alone. This finding aligns with global research, including Card's (2001) study on labor market-driven migration and Moretti's (2012) research on innovation hubs, which emphasize that individuals are more likely to relocate to areas that offer economic opportunities and a demand for their skills.

The policy implications of this study suggest that in order to enhance the attractiveness of northern regions, Kazakhstan's internal migration strategy should integrate educational incentives with stronger employment programs, housing initiatives, and infrastructure development. Kazakhstan could also draw inspiration from European nations, where vocational training is closely linked to regional labor markets (Brücker et al., 2019).

Future research should explore the longer-term effects of the program and examine additional factors that affect migration, such as regional economic growth, social networks, and salary disparities. Policymakers should consider expanding labor market support programs and offering targeted incentives to retain talented workers in labor-deficient regions. Given the limited

impact of "Serpin-2050," education alone is unlikely to become an effective tool for regional economic growth and migration regulation without a holistic approach.

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