“Regional differentiation of higher education outcomes and graduate employment: Evidence from Kazakhstan”

AUTHORS	Anel Kireyeva Akarys Torebekov Gulbakhyt Olzhebayeva Ivan Digel Elvira Nurekenova

ARTICLE INFO	Anel Kireyeva, Akarys Torebekov, Gulbakhyt Olzhebayeva, Ivan Digel and Elvira Nurekenova (2026). Regional differentiation of higher education outcomes and graduate employment: Evidence from Kazakhstan. *Problems and Perspectives in Management*, *24*(1), 741–754. doi:10.21511/ppm.24(1).2026.48
DOI	http://dx.doi.org/10.21511/ppm.24(1).2026.48
RELEASED ON	Tuesday, 31 March 2026
RECEIVED ON	Tuesday, 27 January 2026
ACCEPTED ON	Tuesday, 17 March 2026

JOURNAL	"Problems and Perspectives in Management"
ISSN PRINT	1727-7051
ISSN ONLINE	1810-5467
PUBLISHER	LLC “Consulting Publishing Company “Business Perspectives”
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
36	2	8

BUSINESS PERSPECTIVES

LLC "CPC "Business Perspectives"
Hryhorii Skovoroda lane, 10,
Sumy, 40022, Ukraine

www.businessperspectives.org

Anel Kireyeva (Kazakhstan), **Akarys Torebekov** (Kazakhstan), **Gulbakhyt Olzhebayeva** (Kazakhstan), **Ivan Digel** (Germany), **Elvira Nurekenova** (Kazakhstan)

REGIONAL DIFFERENTIATION OF HIGHER EDUCATION OUTCOMES AND GRADUATE EMPLOYMENT: EVIDENCE FROM KAZAKHSTAN

Abstract

Despite the growth of investments in higher education and innovative infrastructure in Kazakhstan, institutional and regional differences continue to shape heterogeneous outcomes in graduate employment. This study aims to assess the impact of higher education on the economic development and employment of graduates in Kazakhstan, while accounting for regional differences. The empirical research base is formed using official and publicly available statistical data from the Bureau of National Statistics and other government agencies of the Republic of Kazakhstan for the period 2000–2024. The study employs panel data econometric methods, including fixed-effects models and extended specifications. The results of the analysis show that investments in fixed assets per capita are positively and statistically significantly related to the level of gross regional product ($\beta = 0.2855$; $p < 0.01$), while average wages do not have a statistically significant effect ($p = 0.941$). The higher education index and the level of urbanization have negative and statistically significant coefficients ($p < 0.05$), and innovation activity shows a positive effect only in alternative model specifications. The results obtained emphasize the importance of considering the institutional and spatial characteristics of regions when forming management policies in the field of higher education, youth employment, and regional economic development.

Keywords education, higher education, innovation, employment, graduate employment, labor market, urbanization, region, regional development, Kazakhstan

JEL Classification I22, O38, R11

Type of the article: Research Article

Received on: 27th of January, 2026
Accepted on: 17th of March, 2026
Published on: 31st of March, 2026

Anel Kireyeva, Ph.D. in Economics, Associate Professor, Head of the Department of Innovative and Technological Development, Institute of Economics CS MSHE RK, Kazakhstan. (Corresponding author)

Akarys Torebekov, Ph.D. Candidate, Researcher, Department of Scientific Activity, University of International Business named after K. Sagadiyev, Kazakhstan.

Gulbakhyt Olzhebayeva, Ph.D. Candidate, Almaty Management University, Kazakhstan.

Ivan Digel, Ph.D. Candidate, University of Kassel, Germany.

Elvira Nurekenova, Ph.D. in Economics, Professor, Business School, D. Serikbayev East Kazakhstan State Technical University, Kazakhstan.

Conflict of interest statement:
Author(s) reported no conflict of interest

INTRODUCTION

The role of higher education is crucial for long-term economic prosperity, human capital accumulation, and labor productivity. Higher education contributes to the accumulation of knowledge, the development of professional and universal skills, and increases the adaptability of human capital to technological and structural changes. Universities also create and disseminate knowledge, contributing to the development of the economy's research and innovation capacity and strengthening the links between education, science, and industry.

The economic impact of higher education is determined by the demand for graduates in the labor market and by their ability to apply the competencies they acquire in professional activities. It is through the employment of graduates, the level and dynamics of their salaries, and the matching of jobs to their skill levels that the real contribution of higher education to economic development is realized. However, when there is a mismatch between staff training and the structure of demand for skilled labor, graduates face re-

training, skill mismatches, and underutilization of human capital, thereby reducing the effectiveness of educational investments and limiting the economic returns to higher education.

Kazakhstan is characterized by high regional differentiation, with economic activity, highly skilled jobs, and innovative resources concentrated in a limited number of regions. The asymmetric territorial distribution of economic activity increases differences in employment opportunities for graduates and stimulates the selective migration of human capital to economically stronger regions. In countries with high territorial heterogeneity, ignoring regional context can lead to inefficient resource allocation in higher education and the labor market. Understanding regional differences in the impact of higher education is of great practical importance for the development of differentiated educational and regional policies.

Despite the growing interest in educational and skill mismatches, most existing research focuses on individual graduate trajectories or aggregated cross-country comparisons. Regional differences in the mechanisms of interaction between higher education and the labor market, as well as their impact on economic development, remain insufficiently studied, especially in countries with pronounced territorial heterogeneity. In Kazakhstan, few studies comprehensively analyze the relationship among higher education, economic development, and graduate employment at the regional level; existing studies are fragmentary.

1. LITERATURE REVIEW AND HYPOTHESES

Higher education has become an increasingly important factor shaping regional economic development and labor market dynamics. Universities play a key role in the formation of human capital, the generation of knowledge, and the diffusion of innovation across regions. At the same time, the economic effects of higher education are not uniform across territories, as they depend on the structural characteristics of regional economies, labor market conditions, and institutional environments. However, empirical studies show that the returns from higher education are geographically heterogeneous. Wiers-Jenssen and Try (2005) demonstrated that, under limited structural demand, universities perform a socially stabilizing rather than an income-growth function. The effectiveness of higher education increases in regions with a developed innovation environment and weakens under unfavorable macroeconomic conditions (Budría & Moro-Egido, 2014; Borgna et al., 2019). Hammond and Thompson (2008) and Dotti et al. (2013) emphasized the role of metropolitan demand concentration and graduate migration in shaping spatially differentiated educational returns. Crescenzi et al. (2016) highlight the cumulative advantages of high-growth regions, while Turganbayev (2016) points to the limited mechanisms of interregional convergence. Thus, within this approach, two interpretations emerge: education as an engine of growth and education as a factor whose effect depends on the territorial and institutional environment. However, this block does not sufficiently explain why, even in developed regions, education does not always translate into economic benefits.

The second approach is represented by skill mismatch theory, which shifts the focus of analysis from territorial differentiation to structural discrepancies between the supply of skills and labor market demand. As higher education expands, the prospects for skilled human capital become increasingly uncertain (Marginson, 2016). Figueiredo et al. (2017) and McGuinness et al. (2018) document a growing prevalence of over-education and underemployment among graduates. Iriondo and Pérez-Amaral (2016) and Mateos-Romero and Salinas-Jiménez (2017) distinguish between educational and competency-based disparity, demonstrating that these are different institutional mechanisms. Li et al. (2018) confirm that matching skills and employment requirements is accompanied by a wage premium. Cultrera et al. (2022), Iriondo Múgica (2022), and Aytun and Meçik (2023) show the persistence of income penalties associated with over-education and a more pronounced negative effect of skills mismatch. Esposito and Scicchitano (2022) describe the emergence of a trap of unstable employ-

http://dx.doi.org/10.21511/ppm.24(1).2026.48

ment. Thus, within this approach, a key contradiction emerges: the quantitative expansion of higher education does not necessarily lead to economic benefits. However, the mismatch theory mainly focuses on the individual level and does not fully account for the spatial dimension of regional economic development.

The third approach combines elements of institutional theory and spatial economics, focusing on filtering mechanisms, educational signal inflation, and the structural shortage of high-skilled jobs. Hsiao et al. (2023) show that the diploma acts as the primary filter, whereas real competencies matter later. Osseiran (2020) and Didier (2022) analyze the phenomenon of educational signal inflation. Green and Henseke (2021) emphasize that the problem is not so much an over-education as a lack of challenging jobs. Lohberger and Braun (2022) and Piróg and Hibszer (2022) fix the gap in the development of soft and digital skills. Choi and Bae (2020) and Zając et al. (2023) demonstrate the sectoral differentiation of risks associated with skills mismatch. Chaudhry et al. (2022) and Draissi et al. (2023) point to inefficient use of human capital. Kessy (2025) highlights the need for institutional solutions, including the coordination of education, science, and industry. This approach extends the analysis to the regional level, but remains fragmented: spatial heterogeneity, institutional concentration of universities, and the youth labor market are considered separately.

Panel studies confirm the persistence of the negative effects of educational and competence inconsistencies even after controlling for fixed individual and regional factors. It has been found that competence disparity negatively affects wages, while the penalty for over-education tends to decrease (Khalfaoui & Derbali, 2021; Iriondo Múgica, 2022). For some employees, over-education is associated with long-term unstable employment, rather than a quick transition to appropriate positions (Esposito & Scicchitano, 2022). At the macro level, cross-country panel assessments confirm the conditional nature of the impact of higher education on economic growth: the quantitative expansion of graduate training does not ensure sustainable growth without the economy's ability to use them productively (Khalfaoui & Derbali, 2021).

Cluster analysis is used to typologize students and educational trajectories, as well as at the organizational and university levels (Gryshchenko et al., 2021; Pocol et al., 2022; Loder, 2025; Rodríguez & Pusillo, 2025). In addition, this method is used at the cross-country level to group socio-economic development models (Apostu et al., 2024). At the same time, regional differences like the interaction between higher education and the labor market, and their contribution to economic growth, remain insufficiently disclosed.

The Kazakhstani context demonstrates a combination of territorial asymmetry and limited absorption capacity of regional labor markets. Jonbekova et al. (2023) report instability in graduate students' employment. Serikbayeva and Abdulla (2022) show that there are economic losses from the underutilization of human capital. Turganbayev (2016) and Abdulla (2021) emphasize the institutional and economic differences of the regions. Empirical evidence indicates a deepening regional gap, with demand for skilled labor concentrated in a limited number of territories. However, existing research either focuses on the individual level or analyzes macroeconomic dynamics without integrating the institutional concentration of educational organizations.

Thus, existing research demonstrates that the impact of higher education on economic development is structurally determined and geographically heterogeneous. On the one hand, education is a source of growth and innovation; on the other hand, its economic impact is limited by the institutional environment, the structure of demand, and the problem of skills mismatch. However, these mechanisms are mainly analyzed separately, which does not allow the formation of an integrated model of the spatially differentiated realization of human capital.

The analysis of scientific sources shows that the impact of higher education on regional economic development is primarily viewed through the prism of human capital and innovation. However, existing research does not pay enough attention to the institutional concentration of educational organizations as a factor of spatial economic differentiation. In addition, limited attention is paid to the role of the youth segment of the labor market

as a condition for transforming educational potential into the region's economic results.

Based on the identified research gap, the aim of the study is to assess the impact of higher education on economic development.

Based on the literature review, the following research hypotheses are formulated:

H1: The institutional concentration of higher education has a statistically significant impact on regional economic development.

H2: Regional innovation activity has a statistically significant impact on regional economic development.

H3: The conditions of the youth labor market have a statistically significant effect on regional economic dynamics.

2. METHOD

The study uses a multi-stage empirical design aimed at consistent data analysis, from identifying common trends and interregional differences to assessing the enduring relationships between key variables. The methodological approach combines descriptive analysis, panel-data econometric modelling, and regional cluster analysis, enabling the identification of average effects and their manifestations. This step-by-step approach allows for the accounting for the regional heterogeneity in the functioning of higher education systems and labor markets. Panel data analysis allows for accounting for regional differences and dynamics over time. At the same time, cluster analysis differs between regions by type. Together, the applied methods provide a holistic empirical analysis of the impact of higher education on economic development and on graduates' employment.

Therefore, the study uses panel data from 17 regions of Kazakhstan for the period 2004–2024, based on official regional statistics (where available). The main sources of information are data from the Bureau of Statistics of the Republic of Kazakhstan and official annual statistical collections. To assess the level of economic development in the regions, data on gross regional product, fixed-asset investments, and average monthly wages were used. Indicators characterizing the state of regional labor markets include youth unemployment, urban population, and net migration rates.

Table 1. Description of variables used in the analysis

Section	Variable code	Definition	Unit	Data Source
Economic development	GRP	Gross regional product	KZT per capita	Bureau of National Statistics
	INV_PC	Investment in fixed capital per capita	KZT per capita	Bureau of National Statistics
	WAGE	Average nominal monthly wage in the region	KZT	Bureau of National Statistics
Labor market outcomes	Y_UNEMP	Share of unemployed youth aged 15–34 in the labor force	percentage	Bureau of National Statistics
	NET_MIG	Net migration balance per 1,000 population	per 1,000 persons	Bureau of National Statistics
	URBAN	Share of urban population in total population	percentage	Bureau of National Statistics
Higher education system characteristics	HE_INDEX (composite index based on two variables)	Total number of universities and their branches in the region	units	Our calculations are based on the Bureau of National Statistics
		Number of universities and branches per 100,000 population	units per 100,000	Our calculations are based on the Bureau of National Statistics
Innovation environment	INNOV	Share of innovation-active enterprises in the region	percentage	Bureau of National Statistics
	RD_EXP	Expenditure on research and development	million KZT	Bureau of National Statistics

Note: All variables are compiled at the regional level (region × year) for Kazakhstan, covering 2004–2024. The panel is unbalanced due to data availability.

http://dx.doi.org/10.21511/ppm.24(1).2026.48

Due to data limitations, graduate employment is indirectly assessed using youth labor market indicators and regional economic outcomes. Data on innovation activity are presented through indicators of research and development expenditures and the share of innovatively active enterprises in the region. Higher education system data are an aggregated indicator that reflects the distribution of universities across regions. The characteristics of the higher education system are represented by a composite indicator of the institutional concentration of higher education (HE_INDEX), constructed from the number of higher education institutions and their branches in the region, and the density of universities per 100,000 population. The variables used are detailed in Table 1.

The variables are grouped into sections based on their roles in explaining the relationships among higher education, youth employability, and labor market outcomes. This structure allows distinguishing between key explanatory variables, outcome variables, and regional control factors. All indicators are presented in a comparable form and used in panel data format, allowing for both interregional differences and indicator dynamics over time. The monetary variables were transformed to logarithmic form, which is standard practice in empirical research on regional development and the labor market. The panel is unbalanced due to differences in the availability of statistical data across regions and time periods.

The analytical research procedure comprises several successive stages, as shown in Figure 1.

The diagram illustrates the sequence of empirical analysis stages. The research was constructed in stages, from data collection to applied conclusions. In the first stage, regional panel data are collected, allowing for passage to subsequent analysis. In the second stage, a descriptive analysis of the data is conducted, including the calculation of key statistical characteristics and the analysis of interregional heterogeneity. Additionally, the dynamics of gross regional product are considered, enabling identification of long-term trends in regional economic development and differences between regions. At the third stage, panel econometric modelling with fixed effects is applied. This approach assesses the interrelationships among regional economic development, labor-market characteristics, the innovative environment, and the parameters of the higher education system, while accounting for time-invariant regional characteristics. In the fourth stage, the regions are typologized using cluster analysis. The regions are grouped by economic development and institutional environments, enabling interpretation of the impact of higher education across regions. The

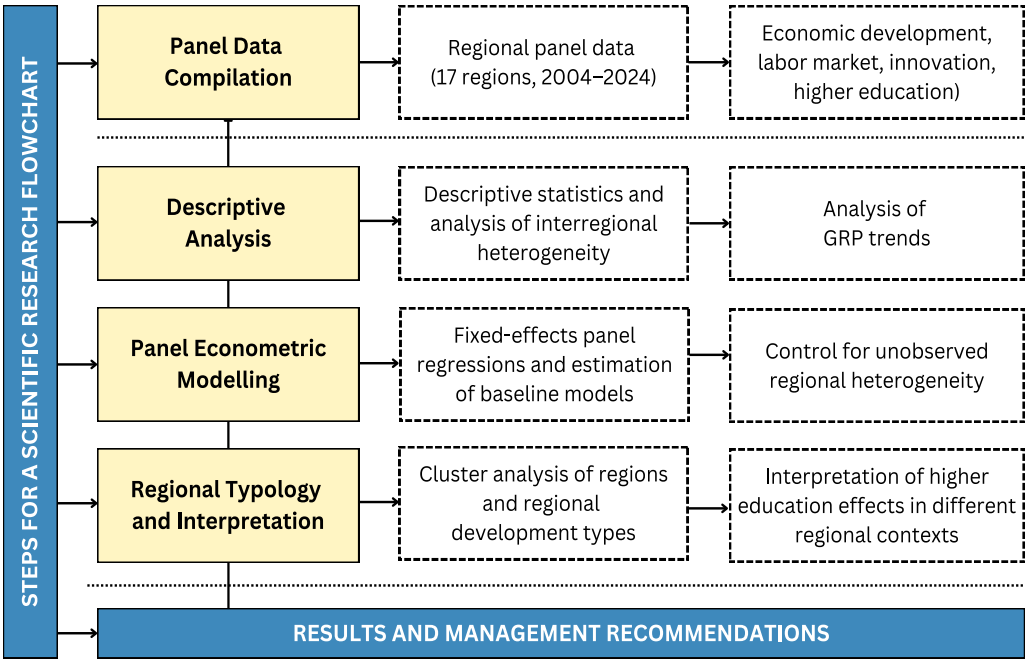

Figure 1. Analytical framework of the study

final stage includes generalizing the empirical results and formulating conclusions and recommendations for the development of the higher education system, taking regional specifics into account.

Statistical processing and empirical data analysis were performed using STATA 18.

3. RESULTS

First, descriptive statistics were calculated, and the dynamics of key indicators were analyzed, enabling the identification of interregional heterogeneity and the justification for the subsequent use of panel regression models. Descriptive statistics are used to make a preliminary assessment of the distribution of variables, identify inter-regional heterogeneity, and justify the use of panel regression models with fixed effects.

Thus, Table 2 shows the distribution of variables used in the panel analysis for 17 regions of Kazakhstan for the period 2004–2024.

Table 2. Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min
LN_GRP	418	14.025	1.239	10.963
LN_INVPC	389	12.508	1.089	9.065
LN_WAGE	433	11.317	1.007	9.055
LN_RD	446	6.647	1.819	0.640
INNOV	384	24.800	15.149	0.000
HE_INDEX	425	0.850	0.872	0.065
URBAN	464	59.012	22.521	12.990
Y_UNEMP	409	7.085	4.592	2.000
NET_MIG	464	–0.963	15.040	–29.504

There is pronounced inter-regional heterogeneity in both economic development indicators and higher education system characteristics, indicating differences in the conditions of employment formation and economic opportunities for graduates. Thus, the LN_GRP variable has an average of 14.025 and a standard deviation of 1.239, indicating noticeable interregional differences in economic development. Among the factors of economic development, investment per capita (LN_INVPC) and wage level (LN_WAGE) exhibit relatively stable distributions, with standard deviations of about 1, indicating moderate variability between regions and over time. The variable reflecting research and development costs (LN_RD) exhibits a higher variance (Std. Dev. = 1.819), indicating significant differences in R&D intensity across regions.

The innovation activity indicator (INNOV) shows noticeable interregional variation, reflecting the uneven distribution of innovation activity across regions. The higher education index (HE_INDEX) has a relatively high average value (0.850) and moderate variability, indicating heterogeneity in the quality and accessibility of higher education within the regional context. The share of the urban population is characterized by an average of 59.012 and a high standard deviation, indicating significant interregional differentiation in urbanization. The youth unemployment rate (Y_UNEMP) varies little across regions, whereas the net migration indicator (NET_MIG) varies significantly and can be positive or negative, reflecting differences in regional migration dynamics.

The descriptive statistics indicate significant interregional differences, which warrant further analysis of the relationships among variables. Figure 2 shows the dynamics of the average logarithm of the gross regional product (LN_GRP) by region for the period 2004–2024.

Figure 2 shows a steady trend of GRP growth, indicating a long-term increase in the level of economic development of the regions. In 2003–2008, LN_GRP experienced relatively high growth rates compared to subsequent years. Thus, during 2009–2014, the growth rate of this indicator slowed, possibly due to external economic shocks and adaptation processes in regional development. During 2015–2024, the positive dynamics remain, but the growth has become more moderate, even compared to previous periods.

As part of this stage of econometric analysis, a basic fixed-effects model is evaluated to identify relationships among higher education outcomes, economic development, and graduate employment. The descriptive statistics (Table 2) and the dynamics of the GRP indicator (Figure 2) indicate the need to use panel data regression analysis to assess regional development factors. Thus, the results of the basic regression model with fixed effects are presented in Table 3.

http://dx.doi.org/10.21511/ppm.24(1).2026.48

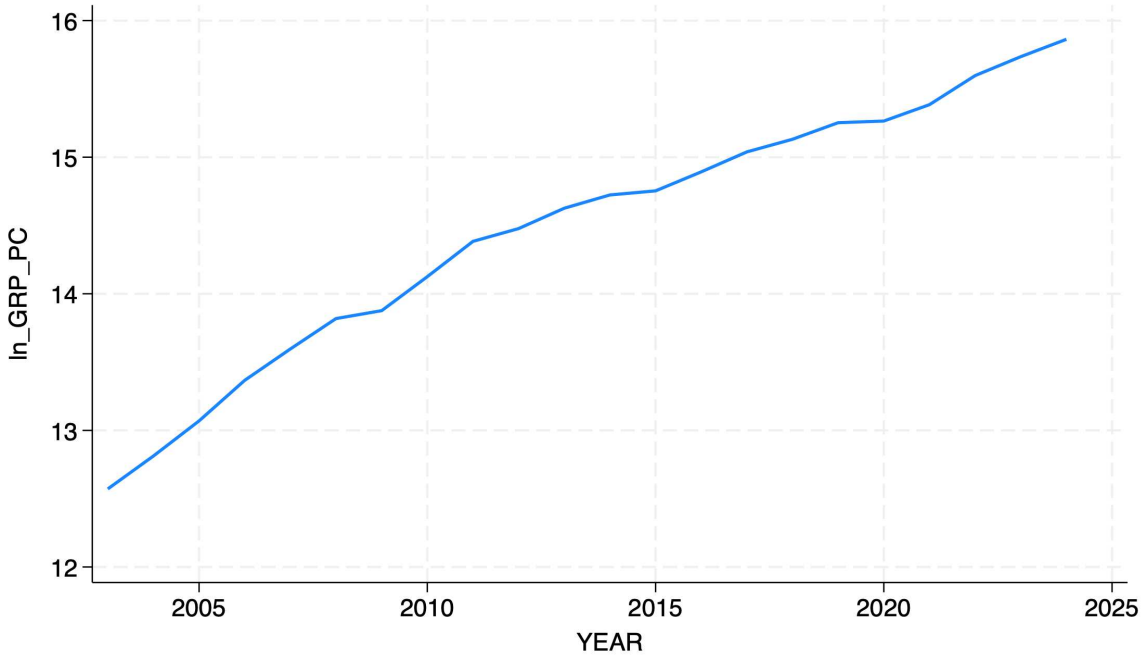

Figure 2. Dynamics of average GRP across regions of Kazakhstan for 2004–2024

Table 3. Fixed-effects regression results for regional economic development

Variable	Coefficient	Std. Error	t-statistic	p-value
LN_INVPC	0.2590	0.1215	2.13	0.034
LN_WAGE	−0.0011	0.0154	−0.07	0.941
INNOV	−0.0020	0.0032	−0.63	0.528
HE_INDEX	−0.0002	0.0001	−3.27	0.001
URBAN	−0.0030	0.0015	−2.05	0.041
Y_UNEMP	−0.0028	0.0055	−0.51	0.614
NET_MIG	−0.0010	0.0014	−0.71	0.477
Model statistics				
Number of regions: 17				
R^2 (within): 0.982				
F-statistic: 570.97 ($p < 0.001$)				

Note: Robust standard errors are reported in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.10.

The regression results show that the chosen specification captures well the differences in regional economic development. A high value of the coefficient of determination (R^2 within = 0.982) means that the model explains most of the changes in the indicator within regions over time. *F*-statistics confirm the model's overall statistical significance at $p < 0.001$. The results show that investments in fixed capital per capita (LN_INVPC) are positively and statistically significantly associated with regional gross product, confirming the important role of investment activity in regional economic development. At the same time, the average wage (LN_WAGE), after controlling for fixed regional effects, does not have a statistically significant effect on GRP dynamics. The higher education index (HE_INDEX) has a negative and statistically significant coefficient, which may reflect a structural mismatch between the scale and institutional characteristics of the higher education system and the actual needs of regional labor markets. It should be noted that the higher education index is an institutional proxy reflecting the concentration of higher education institutions rather than education quality, graduate skills, or employment outcomes. The negative association between the level of urbanization (URBAN) and GRP dynamics may reflect specific features of regional spatial development, including infrastructural constraints and the uneven distribution of economic activity in more urbanized areas.

Research and development expenditures, as well as the share of innovatively active enterprises, do not show a statistically significant impact on the fixed-effects model, suggesting that their effects are not immediately apparent. Further, an additional analysis is performed using the lagged innovation variable (Table 4).

The results of the extended model confirm the stability of the main conclusions of the basic specifi-

Table 4. Fixed-effects model with lagged innovation variable for regional economic development

Variable	Coefficient	Std. Error	t-statistic	p-value
LN_INVPC	0.3910***	0.1174	3.33	0.001
LN_WAGE	0.0126	0.0156	0.81	0.420
INNOV	−0.0029	0.0033	−0.87	0.383
HE_INDEX	−0.00001	0.000005	−2.87	0.004
URBAN	−0.0009	0.0015	−0.62	0.535
Y_UNEMP	−0.0039	0.0057	−0.68	0.494
NET_MIG	−0.0005	0.0014	−0.35	0.727
Model statistics Number of regions: 17 R^2 (within): 0.980				

Note: Robust standard errors are reported in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.10.

cation. Investments per capita maintain a positive, statistically significant impact on GRP (β = 0.2897; $p < 0.05$), indicating the important role of investment activity in long-term regional economic dynamics. Compared with the basic model, the investment factor remains important, confirming the sustainability of the results. The higher education index (HE_INDEX) maintains a negative, statistically significant coefficient, confirming the stability of the previously identified result. The level of wages (LN_WAGE), the share of the urban population (URBAN), the youth unemployment rate (Y_UNEMP), and migration (NET_MIG) do not demonstrate a statistically significant impact on GRP within the framework of this model, which indicates their limited explanatory power after considering fixed regional effects and investment dynamics. The results indicate that the impact of innovation activity on regional economic growth is not directly evident during the period under review.

Significant differences across regions in economic development, innovation activity, and labor-market conditions create heterogeneous conditions for graduate employment. In this regard, the analysis of higher education requires considering not only the characteristics of the educational system, but also the regional economic context within which graduates are integrated into the labor market. This stage of the analysis aims to identify how regional economic conditions shape the relationship between higher education and graduate employment.

Three key sets of indicators are used to describe the regional context. First, the number of higher education institutions (HE_INDEX) is considered an institutional characteristic of the regional educational environment, reflecting the concentration of universities and the potential scale of training for the skilled workforce. Secondly, the youth unemployment rate (Y_UNEMP) is used as an indicator of the state of the youth segment of the regional labor market, into which graduates and young professionals are integrated. Thirdly, differences between regions in terms of economic development and innovation activity are considered, which form the demand for qualified human capital.

To further analyze the role of the regional context of higher education and the labor market, an alternative fixed-effects model specification was evaluated. This model is not intended to replace the basic estimates presented above, but rather to clarify and interpret the identified regional heterogeneity. The alternative specification is used to test the robustness of conclusions and identify mechanisms of regional differentiation, rather than to reevaluate the underlying dependency. The results of the alternative model evaluation are presented in Table 5.

The results of the alternative specification indicate that the model has high explanatory power. The R2 value of 0.9203 indicates that 92% of the intragroup variation is explained by the included factors, and the F-statistics confirm the model's overall statistical significance (p < 0.001). According to the p-value (0.8231), the regions differ significantly. Regions with higher wages tend to have higher GRP, as confirmed by (WAGE) coefficients ($t = 6.42$; $p < 0.001$). Youth unemployment (Y_UNEMP) has a negative, statistically significant effect (β = -0.1308; $p < 0.001$), indicating that rising youth unemployment hinders regional economic

http://dx.doi.org/10.21511/ppm.24(1).2026.48

Table 5. Alternative fixed-effects regression model for regional economic development

Variable	Coef.	Clustered Std. Error	t	p-value	95% CI
INV_PC	–0.0012	0.0547	–0.02	0.982	[–0.1172; 0.1147]
WAGE	0.0000	0.0000	6.42	0.001	[0.0000; 0.0000]
Y_UNEMP	–0.1308	0.0118	–11.09	0.001	[–0.1558; –0.1058]
NET_MIG	–0.0014	0.0033	–0.44	0.664	[–0.0084; 0.0055]
URBAN	–0.0006	0.0063	–0.09	0.926	[–0.0138; 0.0127]
HE_INDEX	–0.0368	0.0778	–0.47	0.643	[–0.2017; 0.1282]
RD_EXP	–0.0000	0.0000	–0.62	0.547	[–0.0000; 0.0000]
INNOV	0.0330	0.0099	3.32	0.004	[0.0119; 0.0542]
CONSTANT	14.4881	0.2927	49.49	0.001	[13.8675; 15.1087]
Model statistics Groups = 17 Within R^2 = 0.9203 Overall R^2 = 0.6618 F(8,16) = 491.45 (p<0.001); ρ = 0.8231					

development. Accordingly, the weak integration of young people, including university graduates, into the labor market reduces the potential for regional development. The indicator of innovation activity (INNOV) has a positive, statistically significant effect ($\beta = 0.0330$; $p < 0.01$), indicating that higher innovation activity is associated with higher economic development. In this model, innovation is a significant factor in regional differences.

At the same time, several factors do not have a statistically significant impact on regional economic development. These include spending on research and development (RD_EXP, $p = 0.547$), investment per capita (INV_PC, $p = 0.982$), net migration (NET_MIG, $p = 0.664$), the level of urbanization (URBAN, $p = 0.926$), and the number of higher education institutions (HE_INDEX, $p = 0.643$). After accounting for fixed regional features, these indicators do not constitute an independent intra-regional effect of economic growth. The empirical findings allow for evaluating the proposed research hypotheses. While the significance of some variables varies across model specifications, the overall results provide meaningful insights into the relationship between higher education, innovation, and regional development. The summary of hypothesis testing is presented in Table 6.

Despite the presence of a well-developed educational infrastructure in many regions, the impact of universities on graduate employment and economic development in the country is, on average, heterogeneous. In this regard, cluster analysis is applied at the next stage of the study. The clustering results, presented in Table 7, indicate distinct regions with different conditions for graduate employment.

Table 7. Regional development clusters and higher education context

Cluster	Region
Cluster 1	Almaty city
Cluster 2	Akmola region, West Kazakhstan, Mangystau
Cluster 3	Aktobe region, Almaty, East Kazakhstan, Zhambyl, Karaganda, Kostanay, Kyzylorda, Pavlodar, North Kazakhstan, Turkestan
Cluster 4	Atyrau region, Astana city

The results of the cluster analysis show that the regions of Kazakhstan can be divided into four clusters, differing in economic development, higher education system characteristics, and employment conditions for graduates. Cluster 1 is represented by the city of Almaty and is characterized by a high concentration of higher education institutions, a significant number of students and graduates, and a relatively high salary level.

Table 6. Summary of hypothesis testing

Hypothesis	Statement	Empirical result	Conclusion
H1	Institutional concentration of higher education affects regional economic development	Significant in baseline FE model ($p = 0.001$)	Supported
H2	Innovation activity affects regional economic development	Significant in the alternative model ($p = 0.004$)	Partially supported
H3	Youth labor market conditions influence regional development	Significant in the alternative model ($p < 0.001$)	Supported

Cluster 2 includes Akmola, West Kazakhstan, and Mangystau regions. These regions are characterized by moderate economic development and a limited number of universities. Cluster 3 includes most regions of Kazakhstan, including Aktobe, Almaty, East Kazakhstan, Zhambyl, Karaganda, Kostanay, Kyzylorda, Pavlodar, North Kazakhstan, and Turkestan. This cluster is characterized by average values of economic development and higher education indicators, as well as more limited opportunities for regional labor markets. Cluster 4 is represented by Astana city and Atyrau region, which are characterized by high economic activity, significant investments, and a relatively developed innovative environment. These regions generate demand for highly qualified personnel, but the peculiarities of the economic structure can lead to a selective demand for graduates of certain fields of study.

To identify the differences between the selected clusters in the context of the higher education system and the regional labor market, Table 8 shows the average values of key indicators for each cluster.

Table 8. Higher education and labor market characteristics by regional clusters

Cluster	Number of regions	HE_INDEX (mean)	WAGE (mean)	INNOV (mean)
Cluster 1	1	3.1795	176217.4	8.1045
Cluster 2	3	0.6686	154590.1	4.2742
Cluster 3	10	0.5645	112474.4	7.5890
Cluster 4	3	0.7718	238036.2	8.2789

Graduate employment varies across different regional conditions. Cluster 1 is composed exclusively of the city of Almaty, characterized by a high concentration of higher education institutions (HE_INDEX = 3.18), high average wages (WAGE = 176 217.4), and innovation activity (INNOV = 8.10). This cluster reflects the concentration of educational and innovation potential in one region. At the same time, cluster 2 has a combination of moderate wage values (WAGE = 154590.1) and low innovation activity (INNOV = 4.27), indicating limited demand for highly skilled labor, which may constrain graduate employment opportunities. The low salary level (WAGE = 112474.4) and the small number of universities (HE_INDEX = 0.56) in cluster 3 indicate limited opportunities for graduates in regional labor markets. Cluster 4 is characterized by a high salary level (WAGE = 238036.2) and innovation activity (INNOV = 8.28), indicating a high demand for highly qualified labor and additional opportunities for graduates.

4. DISCUSSION

The results show that expanding the higher education system at the regional level does not automatically accelerate economic growth. The negative relationship between the higher education index and the level of economic development indicates that the accumulation of formal educational capital outstrips regional economies' ability to use it productively. In other words, the problem lies not in the lack of education but in the limited demand for complex competencies.

This effect allows interpreting higher education as a conditional growth factor, the effect of which depends on the structural characteristics of the regional economy. In regions with narrow industry specialization and low employment diversification, expanding training increases the supply of skilled labor without creating appropriate jobs. In these circumstances, the expansion of higher education may increase over-qualification and reduce the average return on investment in human capital. This logic is consistent with findings from studies showing that the return on education is determined by the structure of demand and the institutional environment, rather than solely by the scale of training (Budría & Moro-Egido, 2014; Green & Henseke, 2021).

The negative impact of youth unemployment clarifies the identified mechanism. The high unemployment rate among young people, including university graduates, reflects the weak integration of human capital into the region's economic system. In these conditions, even as educational indicators improve, skills remain underused, and a gap is forming between educational attainment and the content of employment. The thesis confirms that the key limitation is not the offer of diplomas as such, but the shortage of jobs requiring high levels of competence (McGuinness et al., 2018; Iriondo Múgica, 2022). Thus, the negative relationship between the educational index and economic development does not contradict the theory of human capital, but points to the institutional limitations of its implementation.

http://dx.doi.org/10.21511/ppm.24(1).2026.48

The lack of an independent effect on the number of universities further demonstrates that institutional density is not equivalent to economic performance. The mere presence of universities in the region does not guarantee the formation of innovative effects without stable channels of interaction with the industry and without demand for scientific and technological competencies. Given the weak integration of universities into regional production chains, their contribution to economic dynamics remains limited, consistent with the need to develop triple helix mechanisms and knowledge transfer (Pocol et al., 2022).

Cluster analysis enhances the interpretation of the estimates, showing that the impact of higher education varies significantly across regions. In regions with higher innovation activity and a diversified employment structure, the educational potential is more fully realized. In resource-oriented and less diversified regions, higher education performs a primary stabilizing function, without forming a pronounced economic multiplier. This confirms the conditional nature of higher education's impact, as evidenced by international panel studies (Khalfaoui & Derbali, 2021).

In contrast to studies documenting the sustained positive effect of higher education in metropolitan and innovatively developed regions (Hammond & Thompson, 2008; Dotti et al., 2013), the results reflect the specifics of a geographically heterogeneous economy in which demand for skilled labor is concentrated in a limited number of centers. In the absence of spatial coordination mechanisms, educational expansion can exacerbate interregional differences by attracting the most competitive graduates, rather than contributing to the alignment of development.

From a practical point of view, the results indicate the need to move from a policy of quantitative expansion to a model of structural coordination of higher education and regional development. Increasing economic returns requires matching training profiles with the industry specialization of the regions, stimulating interaction between universities and businesses, and creating demand for complex competencies. Without an appropriate institutional environment, educational investments remain limited in their effectiveness.

The research's scientific contribution is the empirical confirmation of the conditional nature of higher education's influence on regional development within a country with pronounced territorial differentiation. It is shown that the key limiting factor is not the scale of the educational system but the regional economy's ability to integrate and use the competencies developed. This clarifies modern interpretations of the theory of human capital, shifting the focus from the supply of education to the structural parameters of demand and the institutional conditions for its implementation.

CONCLUSION

The study aimed to assess the impact of higher education on the economic development and employment of graduates in Kazakhstan, while accounting for regional differences. The results of the analysis show that the impact of higher education on the economic development of regions is ambiguous and depends on the institutional and structural features of the regional economy.

The estimates obtained indicate that investment activity remains one of the key factors of economic growth, while the impact of educational infrastructure and innovation activity is manifested through more complex mechanisms of interaction with the regional labor market and the economic structure of territories. The analysis of regional typology also demonstrates that differences in economic development, innovation environments, and employment opportunities create unequal conditions for the realization of graduates' human capital across regions.

These findings suggest that the contribution of higher education to economic development depends not only on the scale of educational infrastructure but also on the institutional and economic environment in which universities operate. From a policy perspective, improving the effectiveness of higher educa-

tion requires stronger coordination between educational policy, regional economic development strategies, and labor market needs. Such coordination may contribute to a more balanced regional development and a more effective utilization of human capital in Kazakhstan.

AUTHOR CONTRIBUTIONS

Conceptualization: Anel Kireyeva, Gulbakhyt Olzhebayeva.
Data curation: Akarys Torebekov, Gulbakhyt Olzhebayeva, Ivan Digel.
Formal analysis: Akarys Torebekov, Gulbakhyt Olzhebayeva, Ivan Digel, Elvira Nurekenova.
Funding acquisition: Anel Kireyeva.
Investigation: Gulbakhyt Olzhebayeva, Elvira Nurekenova.
Methodology: Anel Kireyeva, Ivan Digel.
Project administration: Anel Kireyeva.
Resources: Akarys Torebekov, Ivan Digel, Elvira Nurekenova.
Software: Anel Kireyeva, Ivan Digel.
Supervision: Anel Kireyeva.
Validation: Anel Kireyeva, Akarys Torebekov, Gulbakhyt Olzhebayeva, Ivan Digel, Elvira Nurekenova.
Visualization: Anel Kireyeva, Akarys Torebekov, Elvira Nurekenova.
Writing – original draft: Anel Kireyeva, Akarys Torebekov, Gulbakhyt Olzhebayeva, Ivan Digel, Elvira Nurekenova.
Writing – review & editing: Anel Kireyeva, Akarys Torebekov, Gulbakhyt Olzhebayeva.

ACKNOWLEDGMENTS

This paper has been funded by the Science Committee MSHE RK (Grant "Modernization of the quality assurance system of higher education in Kazakhstan based on digitalization: development of approaches, mechanisms and information base" BR24992974).

REFERENCES

1. Abdulla, K. (2021). Regional convergence and structural transformation in a resource-dependent country. *Structural Change and Economic Dynamics, 59,* 548-557. https://doi.org/10.1016/j.strueco.2021.10.004
2. Apostu, S. A., Panait, M., Gigauri, I., & Blessinger, P. (2024). Exploring the relationship between urbanization, higher education and female labor force with sustainable development. *Journal of Applied Research in Higher Education, 16*(2), 427-445. https://doi.org/10.1108/JARHE-11-2022-0368
3. Aytun, U., & Meçik, O. (2023). Wage returns to field of study–occupation mismatch in Turkish graduate labor market: Quantile regression approach. *Ege Academic Review, 23*(4), 653-666. https://doi.org/10.21121/eab.1164097
4. Borgna, C., Solga, H., & Protsch, P. (2019). Overeducation, labour market dynamics, and economic downturn in Europe. *European Sociological Review, 35*(1), 116-132. Retrieved from https://www.sensusimpact.com/article/doi/10.1093/esr/jcy046?searchresult=1
5. Budría, S., & Moro-Egido, A. (2014). Overqualification, skill mismatches and wages in private sector employment in Europe. *Technological and Economic Development of Economy, 20*(3), 457-483. https://doi.org/10.3846/20294913.2014.883341
6. Chaudhry, M. A., Khalid, R., & Özcan, R. (2022). Determinants of job mismatch among graduates: A case study of clerical workers at Lahore, Pakistan. *Akademika, 92*(3), 175-185. https://doi.org/10.17576/akad-2022-9203-13
7. Choi, J., & Bae, H. (2020). Changes in early labor market outcomes among young college graduates in South Korea. *Annals of the American Academy of Political and Social Science, 688*(1), 115-136. https://doi.org/10.1177/0002716220906779
8. Cultrera, L., Mahy, B., Rycx, F., & Vermeylen, G. (2022). Educational and skills mismatches: Unravelling their effects on wages across Europe. *Education Economics, 30*(6), 561-573. https://doi.org/10.1080/09645292.2022.2050995
9. Didier, N. (2022). Are we ready? Labour market transit to the digital economy. *Journal of Adult and Continuing Education, 28*(1), 73-97. https://doi.org/10.1177/1477971420983347

http://dx.doi.org/10.21511/ppm.24(1).2026.48

10. Dotti, N. F., Fratesi, U., Lenzi, C., & Percoco, M. (2013). Local labour markets and the inter-regional mobility of Italian university students. *Spatial Economic Analysis, 8*(4), 443-468. https://doi.org/10.1080/17421772.2013.833342

11. Draissi, Z., Rong, Y., & Suliman, M. A. E. (2023). Employability and education mismatch in the Moroccan urban workplace. *SAGE Open, 13*(4). https://doi.org/10.1177/21582440231217890

12. Esposito, P., & Scicchitano, S. (2022). Educational mismatch and labour market transitions in Italy: Is there an unemployment trap? *Structural Change and Economic Dynamics, 61,* 138-155. https://doi.org/10.1016/j.strueco.2022.02.011

13. Figueiredo, H., Biscaia, R., Rocha, V., & Teixeira, P. (2017). Should we start worrying? Mass higher education, skill demand and the increasingly complex landscape of young graduates' employment. *Studies in Higher Education, 42*(8), 1401-1420. https://doi.org/10.1080/03075079.2015.1101754

14. Green, F., & Henseke, G. (2021). Europe's evolving graduate labour markets: Supply, demand, underemployment and pay. *Journal for Labour Market Research, 55*(1), Article 2. https://doi.org/10.1186/s12651-021-00288-y

15. Gryshchenko, I., Ganushchak-Efimenko, L., Shcherbak, V., Nifatova, O., Zos-Kior, M., Hnatenko, I., Martynova, L., & Martynov, A. (2021). Making use of competitive advantages of a university education innovation cluster in the educational services market. *European Journal of Sustainable Development, 10*(2), 336-348. https://doi.org/10.14207/ejsd.2021.v10n2p336

16. Hammond, G. W., & Thompson, E. C. (2008). Determinants of income growth in metropolitan and non-metropolitan labor markets. *American Journal of Agricultural Economics, 90*(3), 783-793. https://doi.org/10.1111/j.1467-8276.2008.01135.x

17. Hsiao, J.-M., Lin, D.-S., & Chuang, C.-C. (2023). Effects of education–job match and employee competency on labor market newcomers' salary: A multi-level analysis. *Journal of Research in Education Sciences, 68*(4), 227-255. https://doi.org/10.6209/JORIES.202312_68(4).0008

18. Iriondo Múgica, I. (2022). Determinants and wage effects of educational mismatch in Spain. *Educación XX1, 25*(1), 219-249. https://doi.org/10.5944/educXX1.30580

19. Iriondo, I., & Pérez-Amaral, T. (2016). The effect of educational mismatch on wages in Europe. *Journal of Policy Modeling, 38*(2), 304-323. https://doi.org/10.1016/j.jpolmod.2015.12.008

20. Jonbekova, D., Kuchumova, G., Goodman, B., Sparks, J., & Kerimkulova, S. (2023). Employment of master's degree graduates in Kazakhstan: Navigating an uncertain labour market. *Central Asian Survey, 42*(2), 402-420. https://doi.org/10.1080/02634937.2022.2141690

21. Kessy, A. T. (2025). Labour market and university–industry cooperation: The case of graduate employability in Tanzania. In P. Neema-Abooki (Ed.), *Quality in African higher education* (vol. 20, pp. 68-89). Brill. https://doi.org/10.1163/9789004731271_005

22. Khalfaoui, H., & Derbali, A. (2021). Quality of human capital accumulation, higher education graduates and economic growth: A comparative analysis between BRICS, Southeast Asian and MENA countries. *Human Systems Management, 40*(5), 723-735. https://doi.org/10.3233/HSM-190855

23. Li, I. W., Harris, M., & Sloane, P. J. (2018). Vertical, horizontal and residual skills mismatch in the Australian graduate labour market. *Economic Record, 94*(306), 301-315. https://doi.org/10.1111/1475-4932.12413

24. Loder, A. K. F. (2025). Multiple enrollments: Clustering dropout and graduation constellations in business administration bachelor's programme. *European Journal of Education, 60*(2), Article e12890. https://doi.org/10.1111/ejed.12890

25. Lohberger, K., & Braun, E. (2022). Comparing learning opportunities of generic skills in higher education to the requirements of the labour market. *Frontiers in Education, 7,* Article 886307. https://doi.org/10.3389/feduc.2022.886307

26. Marginson, S. (2016). High participation systems of higher education. *The Journal of Higher Education, 87*(2), 243-271. https://doi.org/10.1080/00221546.2016.11777401

27. Mateos-Romero, L., & Salinas-Jiménez, M. del M. (2017). Skills heterogeneity among graduate workers: Real and apparent overeducation in the Spanish labor market. *Social Indicators Research, 132*(3), 1247-1264. https://doi.org/10.1007/s11205-016-1338-x

28. McGuinness, S., Pouliakas, K., & Redmond, P. (2018). Skills mismatch: Concepts, measurement and policy approaches. *Journal of Economic Surveys, 32*(4), 985-1015. https://doi.org/10.1111/joes.12254

29. Osseiran, G. (2020). Higher education massification and the changing graduate labour market in the Spanish retail banking industry: A case study. *Oxford Review of Education, 46*(1), 63-78. https://doi.org/10.1080/03054985.2019.1687434

30. Piróg, D., & Hibszer, A. (2022). Do employers really require experience? An analysis of online job adverts and the implications for HE policy. *Studies in Higher Education, 47*(11), 2138-2160. https://doi.org/10.1080/03075079.2021.2020747

31. Pocol, C. B., Stanca, L., Dabija, D.-C., Pop, I. D., & Miscoiu, S. (2022). Knowledge co-creation and sustainable education in the labor market-driven university–business environment. *Frontiers in Environmental Science, 10,* Article 781075. https://doi.org/10.3389/fenvs.2022.781075

32. Rodríguez, S. E., & Pusillo, F. H. (2025). Continuing education programs and student participation at the University of the Republic (Uruguay): An analysis of professional clusters based on preferences. *Revista Educación,*

49(1), Article 60875. https://doi.org/10.15517/revedu.v49i1.60875

33. Serikbayeva, B., & Abdulla, K. (2022). Education–job mismatch: Implications for individual earnings and aggregate output. *Social Indicators Research, 163*(2), 723-752. https://doi.org/10.1007/s11205-022-02912-x

34. Turganbayev, Y. (2016). Regional convergence in Kazakhstan. *Post-Communist Economies, 28*(3), 314-334. https://doi.org/10.1080/14631377.2016.1204745

35. Wiers-Jenssen, J., & Try, S. (2005). Labour market outcomes of higher education undertaken abroad. *Studies in Higher Education, 30*(6), 681-705. https://doi.org/10.1080/03075070500340028

36. Zając, T. Z., Żółtak, T., Bożykowski, M., & Jasiński, M. (2023). All that glitters is not gold: Mixed early labour market outcomes of STEM graduates in Poland. *European Journal of Education, 58*(3), 477-497. https://doi.org/10.1111/ejed.12564

http://dx.doi.org/10.21511/ppm.24(1).2026.48