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RESEARCH ARTICLE
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Evaluating Healthcare Accessibility in Kazakhstan: Urban and Rural Perspectives

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ABSTRACT

This study conducts a comprehensive analysis of regional disparities in demographic and educational indicators in Kazakhstan from 2009 to 2022. Despite the existing literature, which often fails to account for current socio-economic dynamics and regional specificities, this research aims to fill the gap by integrating multiple dimensions - demographic trends, employment rates, and educational attainment - into a holistic assessment. Utilizing a detailed heatmap and correlation matrix, the study identifies key trends and disparities, offering a nuanced understanding of the socio-economic landscape. The findings reveal significant regional differences in birth rates, migration balances, employment trends, and educational outcomes, underscoring the need for targeted policies to address these disparities. Recommendations include investing in healthcare and living conditions to sustain positive demographic trends, enhancing educational infrastructure to improve human capital, and promoting formal employment to reduce economic inequalities. By aggregating these critical indicators, the research provides valuable insights for policymakers and stakeholders to formulate strategies aimed at fostering sustainable socio-economic development across Kazakhstan's regions. The study also highlights the importance of continuous monitoring and adaptation of strategies to effectively address dynamic socio-economic factors.

KEYWORDS: Human Resources, Employment, Migration Patterns, Regional Disparities, Socio-Economic Development, Kazakhstan, Labor Market

SCSTI: 06.52.35

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1. INTRODUCTION

Evaluating human resource potential is critical for any nation aspiring to achieve sustainable economic growth and social development. In Kazakhstan, a country characterized by its vast geographical diversity and significant regional disparities, understanding the dynamics of human capital is particularly vital. Human capital, encompassing the population's skills, knowledge, and abilities, plays a pivotal role in driving productivity, fostering innovation, and enhancing the overall quality of life.

In Kazakhstan, after the development of the "National Human Development Report", the concept of human development has acquired an essential role in planning and defining fundamental priorities, becoming an alternative path. All official planning documents of the country reflect the social needs of the population specified in the Strategy "Kazakhstan – 2030". The long–term development of the country is also implemented based on the ideology set out in the Strategy "Kazakhstan – 2050", which proclaims the idea of a "united nation of strong and responsible people." The principle of human centricity, which is increasingly becoming the basis of national programs, is also spelled out in the National Development Plan of the Republic of Kazakhstan until 2025, which aims to improve the quality of life of the population and increase well-being. The annual messages of the President of Kazakhstan also contain the principles and concepts of human development. Kazakhstan's journey toward becoming a competitive economy is deeply intertwined with its ability to develop and effectively utilize its human resources. The country's strategic vision, aimed at diversifying its economy and reducing dependency on natural resources, hinges on creating a well-educated and highly skilled workforce. This study seeks to provide a detailed examination of the various facets of human capital across the regions of Kazakhstan.

Such attention to human development may indicate significant changes in the country's overall development. One of the leading indicators of these changes is the considerable attention to human-oriented policy, where issues of social needs, including poverty reduction, are gradually coming to the forefront of the country's plans.

Despite the importance of human capital, the field of regional disparities in demographic and educational indicators in Kazakhstan has not been extensively explored, leaving a significant gap in the literature that necessitates more comprehensive studies. Given the rapid socio-economic changes and regional development disparities in Kazakhstan, there is a pressing need for studies that provide a nuanced understanding of these trends and their implications, especially since most existing research fails to account for the current socio-economic dynamics and regional specificities fully.

The significance of analyzing demographic indicators such as birth rates, migration balances, and population growth has become increasingly evident in recent years. These indicators provide critical insights into the population dynamics influencing labor market conditions and socio-economic stability. Migration patterns, in particular, play a crucial role in shaping the demographic landscape, as they affect the size and composition of the workforce and, consequently, the economic potential of regions.

Equally important are employment trends, which are vital in understanding regional disparities. Employment rates, labor force participation, and employment structure (formal vs. informal) are key indicators of economic health and social well-being. Higher employment rates are typically associated with better socio-economic outcomes, including higher income levels, improved health, and reduced crime rates. By analyzing these indicators, we can identify economically thriving regions and those that require targeted interventions to boost job creation and economic activity.

Additionally, educational attainment is another critical dimension that significantly impacts regional development. Education

levels are directly linked to economic opportunities and social mobility, making them crucial to any comprehensive socio-economic analysis. Regions with higher levels of educational attainment, particularly at the tertiary level, tend to experience faster economic growth and innovation. Thus, assessing the distribution and outcomes of educational resources across regions is essential to develop strategies that enhance human capital and foster equitable growth.

The purpose of this study is to comprehensively analyze demographic and educational indicators by region of the Republic of Kazakhstan, identify key trends and differences, and determine the total weight of each region in the overall context. The study aims to identify regions with the greatest and least potential for development, which will allow for the development of recommendations to improve socio-economic conditions and level regional imbalances.

2. LITERATURE REVIEW

The field of regional disparities in demographic and educational indicators in Kazakhstan has not been extensively explored, leaving a significant gap in the literature that necessitates more comprehensive studies. Given the rapid socio-economic changes and regional development disparities in Kazakhstan, there is a pressing need for studies that provide a nuanced understanding of these trends and their implications, especially since most existing research fails to account for the current socio-economic dynamics and regional specificities fully.

Several studies focused on demographic indicators to analyze regional disparities. Demographic trends, such as birth rates, mortality rates, and migration patterns, are essential for understanding population dynamics and their impact on regional development. For instance, Fan (2002) utilized data from China's fifth population census to explore the effects of declining fertility rates on population growth, age composition, and household size at both national and regional levels. The study highlighted the growing demographic differences between eastern coastal regions and the interior, driven by migration and economic disparities (Fan, 2002). Similarly, Matthews and Parker (2013) discussed the increasing integration of spatial data and methods in demographic research. Their work emphasized the importance of spatial econometrics, geographically weighted regression, multilevel modeling, and spatial pattern analysis in revealing local variations in demographic processes. This spatial perspective allows for a more nuanced understanding of regional demographic differences and their implications for policy and planning (Matthews & Parker, 2013). Moreover, Donner and Rodríguez (2008) examined the demographic shifts in the United States and their influence on disaster vulnerability. They argued that population growth, migration, and urbanization have heightened exposure to natural and technological disasters. The study underscored the necessity of considering demographic composition and distribution in disaster risk assessments to enhance community resilience. Yenilmez (2015) highlights the impact of declining fertility rates and increasing longevity on the aging population, subsequently affecting the labor market. A decline in the young working-age population lowers the labor force participation rate and increases the proportion of retired individuals. Governments often consider raising the retirement age to mitigate labor shortages. Similarly, Rees et al. (2012) discussed how Europe was experiencing an aging population and slowing population growth, which led to a decline in the labor force in many regions. Thus, the role of demographic factors in assessing regional development potential is crucial.

Conversely, other researchers emphasize the negative aspects of demographic imbalances. Scientists pointed out that regions with declining birth rates and high emigration rates are challenged in maintaining economic stability and public services, emphasizing that these regions are at risk of population aging,

which can strain healthcare systems and pension schemes. Gu et al. (2021) emphasized that regions are at risk of population aging, which can strain healthcare systems and pension schemes. Moreover, they noted that declining fertility and increasing longevity are leading to an aging world population, which impacts household sizes and increases the need for migration to balance demographic shifts. Bloom and Luca (2016) discussed the global phenomenon of population aging and its significant implications for employment, savings, consumption, economic growth, asset values, and fiscal balance. They highlighted that the aging population could lower labor force participation and savings rates while increasing health expenditures and straining pension and healthcare systems. Davoudi et al. (2010) explored the future scenarios for Europe's demographics, presenting the 'silver century' and 'open borders'. Based on current trends, the 'silver century' scenario indicates continued aging and limited immigration, leading to potential social and spatial segregation. The 'open borders' scenario involves active immigration policies, potentially addressing demographic imbalances and creating challenges in managing social and spatial integration. Both scenarios underlined the importance of policy interventions in managing demographic changes and their socio-economic impacts. Sobotka et al. (2011) analyzed the effects of economic recessions on fertility in developed countries, noting that economic downturns often lead to declining birth rates and delays in childbearing. They emphasized that economic uncertainty and rising unemployment influence fertility behavior, impacting long-term demographic trends. Thus, demographic decline can lead to a shrinking labor force, further exacerbating economic disparities between regions, thus illustrating the critical role of demographic indicators in understanding regional socio-economic health.

Employment is another crucial aspect analyzed by various scholars to understand regional disparities. For instance, Ren et al. (2020) found that while the Northeast China Revitalization Strategy significantly improved regional economic growth and per capita income, it did not significantly enhance regional employment, infrastructure, education investment, or social security and did not mitigate regional disparity. This suggests that the strategy's effects are highly heterogeneous across cities based on their size and characteristics, emphasizing the need for tailored approaches focusing on R&D and human capital investments to prevent technological lock-in. Nurlanova et al. (2019) explored disparities in social and economic development across regions of Kazakhstan. They emphasized the importance of measuring disproportions between economic and social development levels to ensure inclusive development and improve the quality of life. Their study highlights the necessity of targeted regional programs and management decisions to support backward regions, thus ensuring social justice and reducing inequality. Kumar et al. (2020) examined macro-level disparities in India, highlighting significant regional inequalities regarding NSDP, per capita income, HDI, work participation rates, and wages. They found that regions with higher employment rates tend to have better socio-economic outcomes, including higher income levels, better health outcomes, and lower crime rates. Their study underscores the critical need for policy interventions to address these disparities and promote balanced regional development.

Regions with higher employment rates tend to have better socio-economic outcomes, including higher income levels, better health outcomes, and lower crime rates. For example, Hajkowicz et al. (2011) analyzed the relationship between quality-of-life indicators and the gross value of mineral production in Australian regions. They found that mining activity positively impacts incomes, housing affordability, communication access, education, and employment. However, they noted the need to understand and mitigate localized social inequalities and disadvantages. Cairns et al. (2017) systematically reviewed the association between area-level socioeconomic

disadvantage and inequalities in suicidal behavior and self-harm in Europe. They found strong evidence linking high levels of socioeconomic disadvantage with increased risks of suicidal behavior, particularly for men, indicating the critical need for targeted suicide prevention strategies that consider regional socio-economic contexts. Pittau et al. (2010) investigated the role of economic variables in predicting regional disparities in life satisfaction across European Union regions. They found that personal income has a more significant impact on life satisfaction in poorer regions than in richer ones. Unemployment was negatively associated with life satisfaction regardless of regional unemployment levels, highlighting the persistent regional differences in life satisfaction even after accounting for individual characteristics.

Educational attainment is another critical dimension that has been extensively studied in the context of regional disparities. It indicates that regions with higher educational attainment tend to experience faster economic growth and innovation. A well-educated workforce is more adaptable and capable of driving technological advancements and productivity improvements.

Mardenova (2020) examined the importance of developing self-learning skills among school children in Kazakhstan, highlighting the role of these skills in enhancing human capital and promoting socio-economic development. In a similar vein, Baituova et al. (2024) explored the challenges and opportunities associated with human resources development in the context of Kazakhstan's industrial and innovative economy, discussing the critical role of human capital in driving economic growth and competitiveness. They emphasize the need for strategic investments in education, training, and skills development and highlight specific issues faced by the workforce, such as skill mismatches and the rapid pace of technological advancements, proposing policy recommendations to address these challenges and enhance the country's human resource potential. Extending this discourse to the forestry sector, Kirillov et al. (2024) investigated the current status, potential, and human resources problems in Kazakhstan's forestry sector. Their analysis reveals critical issues such as skill shortages, inadequate training programs, and limited professional development opportunities while also exploring the potential for improvement through targeted education and policy interventions. The study underscores the necessity of a strategic approach to addressing these challenges and leveraging the sector's potential for sustainable development.

Lambrechts et al. (2020) investigated the socioeconomic policies, technical focus, and academic necessities essential for developing core competencies and skills in emerging markets to prepare for the technological disruption of the Fourth Industrial Revolution (Industry 4.0). They emphasized the importance of higher education in skill development, particularly for countries like Brazil, Russia, India, China, and South Africa. Spiel et al. (2018) highlighted the multifaceted role of education in promoting social progress. They argued that education fosters humanistic, civic, economic, and social equity purposes, contributing to better knowledge, health, living conditions, social equity, and productivity. The authors stressed the importance of expanding access to quality early childhood education, improving school quality, enhancing the role of educators, and making higher and vocational education more inclusive. They also advocated for the appropriate use of digital technologies to improve the quality and relevance of education, thereby supporting social progress (Spiel et al., 2018). Efe (2023) examined the strategic role of human capital in developing organizational capabilities, emphasizing the importance of highly qualified human resources in improving companies' productivity and achieving strategic goals. He noted that continuous innovation and new products are essential for economic growth, and human capital development is critical for maintaining a competitive advantage.

While each of these sets of indicators—demographic, employment, and educational—provides valuable insights on its own, a

comprehensive analysis requires integrating these dimensions to understand their relationship and combined impact on regional development.

While existing studies provide valuable insights into the individual dimensions of regional disparities, there is a clear need for comprehensive analyses that integrate demographic, employment, and educational indicators. This approach can better capture the complexities of regional development and inform more effective policy interventions. Our study addresses this gap by combining these critical indicators to provide a holistic assessment of regional disparities in Kazakhstan. The results highlight the importance of considering multiple dimensions to understand and address the underlying causes of regional inequalities and promote sustainable socio-economic development.

3. METHODOLOGY

To achieve the study's objectives, a comprehensive quantitative data analysis was employed. This involved the systematic collection, processing, and analysis of statistical information pertaining to the regions of Kazakhstan over the period from 2009 to 2022. The analysis focused on key indicators essential for assessing demographic and educational trends across the regions. The selected indicators and their relevance to the study are outlined as follows:

1) Number of high school graduates: the indicator reflects the number of students who graduated from high school in each region during the study period. This indicator is essential for assessing young people's preparation level for admission to higher education institutions.

2) Number of graduates of higher education organizations: the indicator reflects the number of students who graduated from higher education institutions in each region during the study period. It is key to assessing the region's educational potential and contribution to the training of highly qualified specialists.

3) Migration balance: the indicator reflects the difference between the number of immigrants and emigrants in each region during the study period. A positive migration balance value indicates an influx of population into the region, while a negative value indicates an outflow of population. This indicator is essential for understanding migration trends and their impact on the socio-economic development of the regions.

4) Birth rate: the indicator is expressed as the number of births per 1000 population in each region during the period under study. The birth rate is essential for assessing each region's demographic situation and population growth potential.

The regional shares were calculated and expressed as a percentage of the national values for each of the above indicators. These shares were then aggregated to obtain each region's total weight, which made it possible to determine their contribution to the national demographic and educational indicators. Thus, the stages of the study can be seen more clearly in Figure 1.

Based on a comprehensive literature review, key indicators were identified for analyzing regional disparities in demographic and educational data. These indicators include the number of high school graduates, the number of university graduates, migration balance, and birth rate. These indicators are commonly used in research to assess the socio-economic development of regions.

This study, however, adopts a more comprehensive approach by aggregating the shares of all indicators to obtain an overall weight for each region. This allows for a more precise determination of each region's contribution to national demographic and educational statistics and helps identify regions with the highest and lowest development potential. The critical indicators analyzed include the number of high school graduates, the number of university graduates, migration balance, and birth rate. The data were structured and normalized to ensure comparability between regions and years.

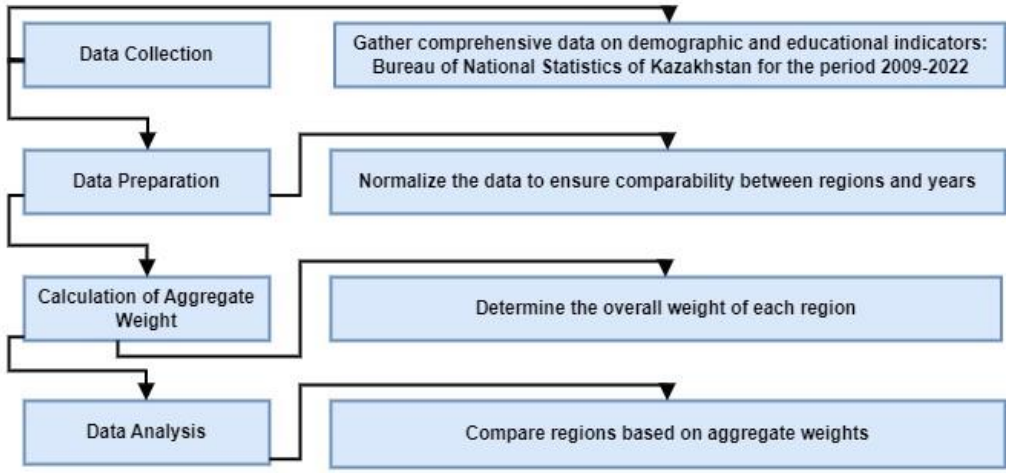

FIGURE 1. Research stages

Note: compiled by authors

4. FINDINGS AND DISCUSSION

The heatmap presents the normalized values of various socioeconomic indicators in Kazakhstan from 2009 to 2022. The indicators include birth rate, population, number of immigrants and emigrants, unemployment rate, workforce size, number of high school and university graduates, number of employed individuals, hired workers, self-employed individuals, and the aggregate weight of these indicators (Figure 2).

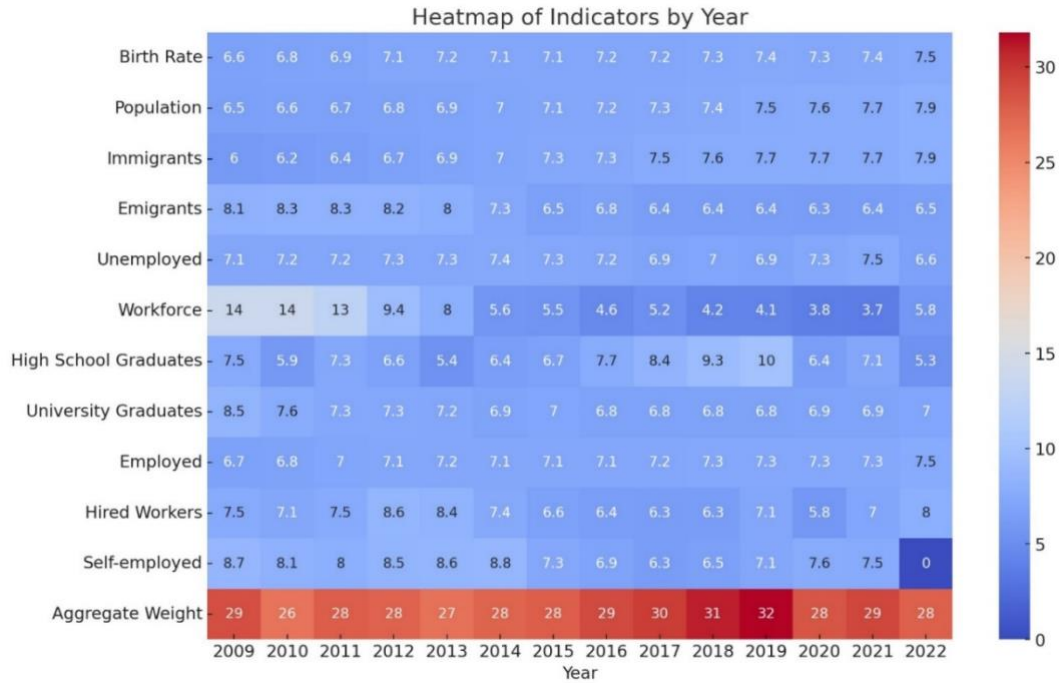

FIGURE 2. Heatmap of indicators, 2009-2022

Note: compiled by authors

Key observations from the heatmap are as follows: The birth rate has shown a steady increase from 6.6% in 2009 to 7.5% in 2022, reflecting a consistent rise in birth rates over the years. Similarly, the population percentage has increased from 6.5% in 2009 to 7.9% in 2022, indicating a growing population. This indicates demographic growth driven by improved living conditions and healthcare. The percentage of immigrants has grown from 6.0% in 2009 to 7.9% in 2022, suggesting a rise in immigration, while the percentage of emigrants decreased from 8.1% in 2009 to 6.5% in 2022, showing a trend of reduced emigration. The unemployment rate remained relatively stable, with slight fluctuations, from 7.1% in 2009 to 6.6% in 2022. However, the size of the workforce saw a significant drop from 13.8% in 2009 to 5.8% in 2022.

Education indicators showed mixed results. The number of high school graduates fluctuated, peaking at 10.0% in 2019 and dropping to 5.3% in 2022. The percentage of university graduates remained relatively stable, around 7%, with minor fluctuations. Employment rates increased from 6.7% in 2009 to 7.5% in 2022, indicating positive trends in job creation and economic activity. The number of hired workers varied, peaking at 8.6% in 2012 and 8.0% in 2022, while the percentage of self-employed individuals fluctuated significantly, reaching 8.8% in 2014 and dropping to 0% in 2022. The aggregate weight of all indicators showed an overall increase from 28.7% in 2009 to a peak of 31.8% in 2019, followed by a decline to 27.8% in 2022.

The heatmap and correlation matrix in Figure 3 illustrate the normalized values and interrelationships of various socio-economic indicators in Kazakhstan from 2009 to 2022.

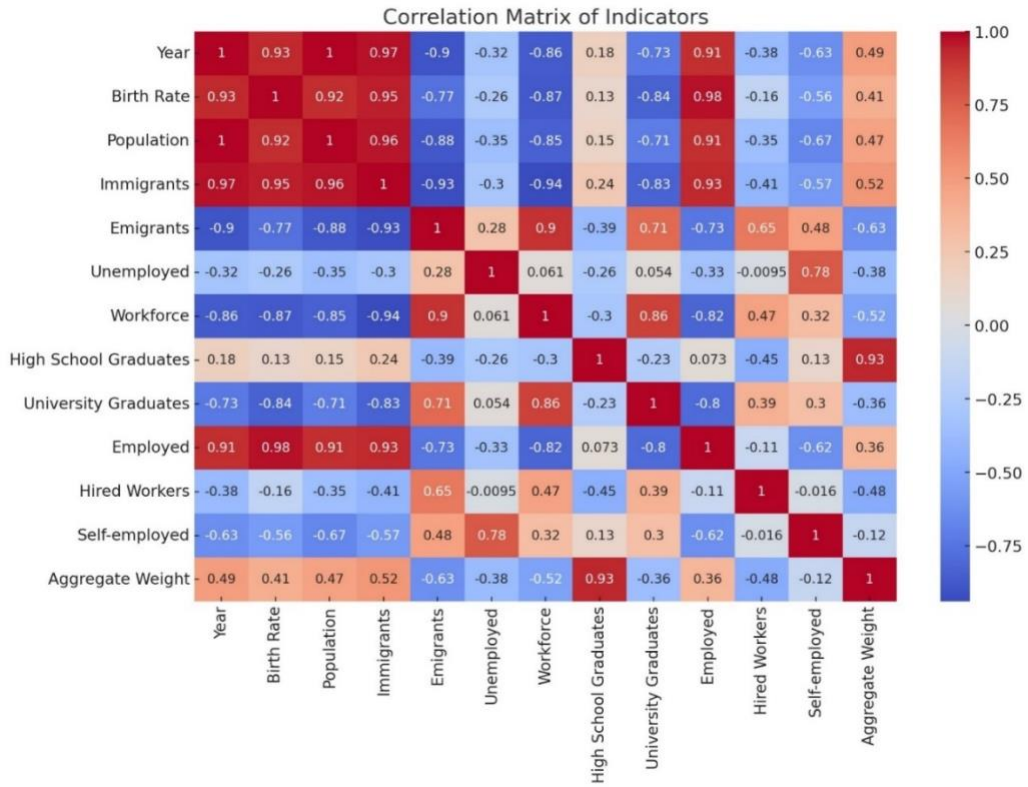

FIGURE 3. Correlation matrix of indicators, 2009-2022

Note: compiled by authors

The indicators include birth rate, population, number of immigrants and emigrants, unemployment rate, workforce size, number of high school and university graduates, number of employed individuals, hired workers, self-employed individuals, and the aggregate weight of these indicators.

The correlation matrix illustrates the interrelationships of various socioeconomic indicators in Kazakhstan from 2009 to 2022. Key observations from the matrix are as follows:

1) Significant Reduction in Workforce Size. The workforce significantly dropped from 13.8% in 2009 to 5.8% in 2022.

2) The decrease in emigration rates from 8.1% in 2009 to 6.5% in 2022 suggests fewer individuals are leaving the country. However, those who emigrate may predominantly be working-age individuals, reducing the workforce size.

3) Fluctuations in the number of high school and university graduates could indicate a mismatch between education outcomes and labor market needs, potentially leading to underemployment or unemployment.

4) Relationship Between Emigration and Unemployment. The scatter plot comparing emigrants to unemployed individuals shows no clear trend, suggesting that emigration may not directly influence unemployment rates.

However, other underlying factors could explain this relationship:

1) Improved economic conditions and job creation could stabilize unemployment rates despite changes in emigration.

2) Some emigrants may return with enhanced skills and experiences, contributing positively to the labor market and mitigating unemployment.

3) A heatmap and a correlation matrix visualize the relationships between various socioeconomic indicators. For example, a positive correlation between birth rates and population highlights demographic growth. At the same time, the relationship between the number of employed workers and self-employed individuals reflects changes in employment structure.

Next, in Figure 4 there are provided results for scatter plot.

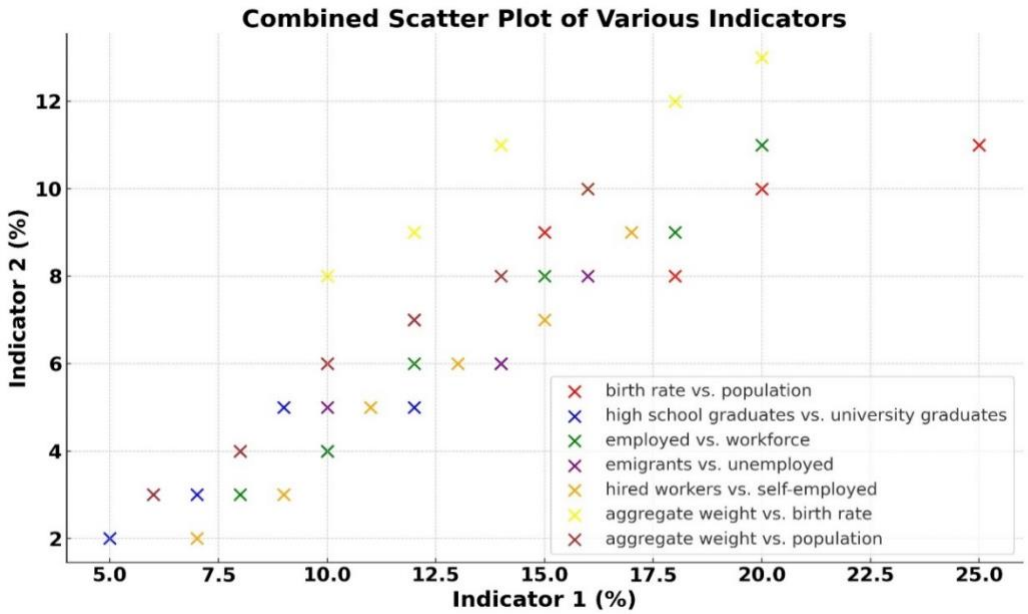

FIGURE 4. Scatter plot, 2009-2022

Note: compiled by authors

The scatter plot presents a detailed examination of various socioeconomic indicators across regions from 2009 to 2022. It reveals notable patterns and correlations that warrant closer analysis to understand regional disparities and their implications for economic policy. The relationship between the birth rate and population, as indicated by the red markers, demonstrates a positive correlation. For instance, regions with higher populations, such as those with values between 15% and 25%, tend to exhibit higher birth rates, ranging from 10% to 12%. Such a trend could be attributed to the demographic structure where larger populations include more women of childbearing age. Additionally, these regions may have better access to healthcare facilities, enhancing maternal and child health services and supporting higher birth rates.

There appears to be a lack of direct correlation between high school graduates and university graduates (blue markers). The data shows that regions with high school graduates with percentages around 5% to 10% do not necessarily translate to similar percentages in university graduates, which vary widely between 2% and 6%. This observation highlights the regional variations in access to higher education. Factors contributing to this discrepancy may include socioeconomic status, availability of higher education institutions, and regional economic opportunities. Policymakers must address barriers to continuing education to ensure that high school graduates can pursue higher education.

The scatter plot also illustrates the relationship between employed individuals and the workforce (green markers), showing a strong positive correlation. The workforce percentages, ranging from 5% to 18%, are closely aligned with the employment figures within the same range. This alignment reflects the economic activity and labor market dynamics within those regions. The correlation between emigrants and unemployed (purple markers) is more complex. Some regions with high unemployment rates, around 6% to 8%, also exhibit high emigration rates, between 8% and 12%, indicating that lack of local job opportunities drives individuals to seek employment elsewhere. This pattern underscores the importance of job creation and economic development in retaining the local workforce and preventing brain drain.

The relationship between hired workers and self-employed individuals (orange markers) reveals varying trends. In some regions, a higher number of hired workers corresponds with fewer self-employed individuals, with percentages ranging from 7% to 12% for hired workers and 2% to 6% for self-employed. This variation may reflect regional economic structures where formal employment opportunities are more prevalent in some areas, while others rely more on entrepreneurial activities and self-employment as economic alternatives. The aggregate weight versus birth rate (yellow markers) and aggregate weight versus population (brown markers) indicate positive correlations. Regions with higher aggregate weights, which denote overall economic activity, tend to have higher birth rates and larger populations. For example, regions with aggregate weights around 100% to 400% exhibit birth rates between 10% and 12% and populations between 15% and 25%. This relationship suggests that better economic conditions and higher economic activity support larger family sizes and population growth. These regions likely benefit from improved living standards, healthcare, and social services, contributing to their demographic growth. From an economic perspective, these findings highlight significant regional disparities that necessitate targeted policy interventions. Regions with higher populations and economic activities demonstrate better socioeconomic outcomes, benefiting from economies of scale, infrastructure investments, and resource availability. Conversely, regions with lower economic indicators face challenges that hinder development and require focused efforts to improve access to education, healthcare, and employment opportunities. The observed discrepancies between high school and

university graduates point to the need for policies that enhance access to higher education. Providing financial support, improving educational infrastructure, and ensuring equitable opportunities for further education can help bridge this gap. Similarly, addressing high unemployment rates through job creation and economic diversification can mitigate the push factors driving emigration and support local economic stability.

Overall, the scatter plot underscores the importance of understanding regional socioeconomic dynamics to inform effective policy-making. By addressing the unique needs of each region and promoting inclusive economic development, policymakers can reduce inequalities and foster sustainable growth, ensuring that all regions benefit from improved socioeconomic conditions. The aggregate weight plotted against the birth rate and population underscores overall socioeconomic development, peaking at 31.8% in 2019 before declining to 27.8% in 2022. This aggregate measure combines multiple indicators to comprehensively view socio-economic trends.

Analyzing the age structure of Kazakhstan's population from 2009 to 2022 is essential for understanding demographic trends and developing socio-economic development strategies (Figure 5).

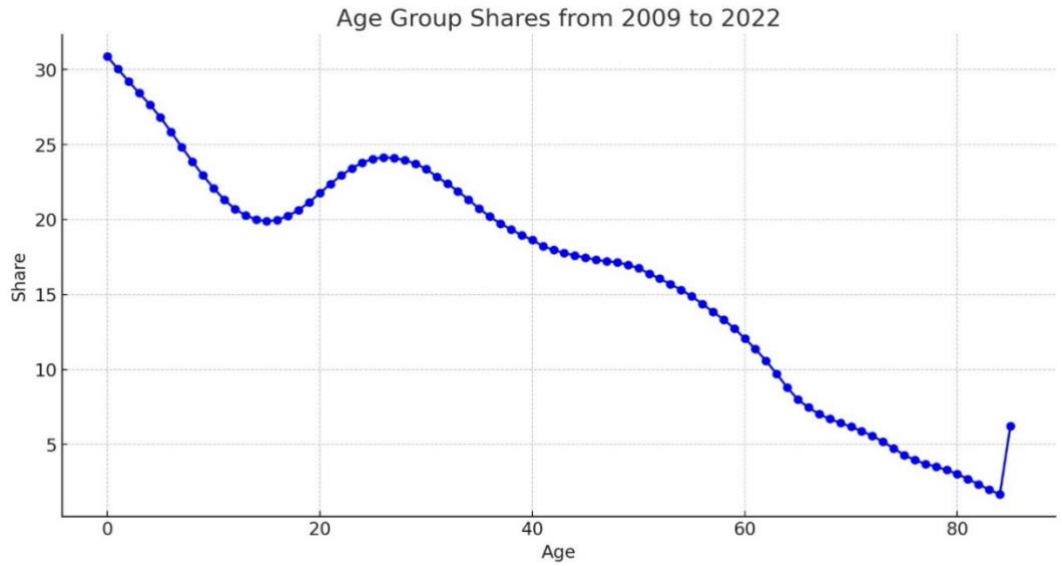

FIGURE 5. Age group (0-85+) share, 2009-2022

Note: compiled by authors

The graph illustrates the shares of different age groups in the population of Kazakhstan from 2009 to 2022. The highest share of the population is seen in the 0-9 years age group, with shares starting at 30,87% for age 0 and gradually decreasing to 22,1% by age 10; the age groups from 11 to 19 show a steady decline from 21,32% at age 11 to 21,15% at age 19, The working-age population (20-60 years) experiences a gradual decrease, starting at 21,76% for age 20 and dropping to 12,07% for age 60, The elderly population (65+ years) shows a significant decrease in share, with 7,99% at age 65 and reaching as low as 1,67% at age 84. However, there is a noticeable spike to 6,25% in the 85+ age group,

An overview of the age distribution in Kazakhstan's population over 13 years highlights a youthful demographic, which could imply a high birth rate and potential for future population growth. This age group starts with the highest share of 30.87% for newborns and decreases to 22.1% by age 10, indicating a typical age progression with a decrease in share

as age increases. The working-age population, aged 20 to 60, demonstrates a gradual decline. At age 20, the share is 21.76%, which diminishes to 12.07% by age 60. This decline suggests a stable working-age population that slowly transitions into retirement age. The elderly population, particularly those aged 65 and above, shows a sharp decrease in population share. The share drops consistently from 7.99% at age 65, reaching 1.67% at age 84. Interestingly, the share rises again to 6.25% for those aged 85 and older, indicating a notable portion of the population living beyond 85 years. This could suggest improved healthcare and living conditions, leading to increased longevity.

An analysis of the age structure of the population is also important for understanding demographic trends. The young demographics, expressed by a high birth rate and a significant proportion of children under 9 years of age, indicate the potential for future population growth. The aging population (65+ years), although a smaller share of the total, still shows an increasing proportion of older people over 85 years of age, which may indicate an improvement in living conditions and life expectancy. These aspects highlight the importance of adapting economic and social policies to account for demographic changes and labor market trends in Kazakhstan.

The results of normalized values indicate several significant socioeconomic trends in Kazakhstan. The increase in birth rate and population percentage suggests a growing population, indicative of improved living conditions and healthcare services. This demographic trend is further supported by the rise in the number of immigrants and the decline in the number of emigrants, pointing towards Kazakhstan becoming a more attractive destination for living and working.

The relatively stable unemployment rate suggests that the job market has been able to absorb the growing population. However, the significant drop in the workforce percentage raises questions about labor market dynamics. This decline could be attributed to various factors, including an aging population, changes in labor force participation, or shifts towards more informal or self-employment sectors.

Education indicators, such as the number of high school and university graduates, have shown fluctuations. The peak in high school graduates in 2019 and the stability in university graduates, around 7%, indicate efforts toward improving educational attainment. However, the decline in the number of high school graduates in recent years might be an area of concern for future workforce readiness.

The employment rate has increased, showing a positive job creation and economic activity trend. The variations in the number of hired workers and self-employed individuals reflect changes in the employment structure, possibly influenced by economic policies, market conditions, and shifts toward entrepreneurship. The overall increase in aggregate weight up to 2019 suggests socioeconomic development, but the decline in recent years highlights emerging challenges that need to be addressed to sustain growth.

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These visualizations provide valuable insights into Kazakhstan's socioeconomic landscape over the past decade. The increasing birth rate and population growth, from 6.6% and 6.5% in 2009 to 7.5% and 7.9% in 2022, respectively, indicate demographic expansion and potentially improved living standards. The stability in educational attainment, seen in the steady percentage of university graduates, around 7%, points to sustained efforts in higher education. Employment trends, such as the increase in employed individuals from 6.7% to 7.5%, highlight the effectiveness of job creation policies and economic activities in absorbing the growing workforce.

However, the lack of a clear trend between emigrants and unemployment rates suggests that other macroeconomic factors or regional disparities may influence these indicators. The employment structure's variability, reflected in the hired workers and self-employed scatter plot, indicates ongoing shifts in the labor market, possibly influenced by economic reforms, market conditions, and entrepreneurial activities. The overall increase in aggregate weight up to 2019 suggests socioeconomic development, but the decline in recent years highlights emerging challenges that need to be addressed to sustain growth.

In conclusion, the combined analysis of these indicators offers a comprehensive understanding of Kazakhstan's socioeconomic trends. Policymakers and stakeholders can leverage these insights to address challenges, such as workforce participation and employment structure while capitalizing on opportunities for demographic and educational improvements. This holistic view is essential for formulating strategies to foster sustainable socioeconomic development in the region.

The significant share of the 0-9 years age group highlights a youthful demographic, which could imply a high birth rate and potential for future population growth. This age group starts with the highest share of 30,87% for newborns and decreases to 22,1% by age 10, indicating a typical age progression with a decrease in share as age increases.

The working-age population, aged 20 to 60 years, demonstrates a gradual decline. At age 20, the share is 21,76%, which diminishes to 12,07% by age 60. This decline suggests a stable working-age population that slowly transitions into retirement age. The elderly population, particularly those aged 65 and above, shows a sharp decrease in population share. The share drops consistently from 7,99% at age 65, reaching 1,67% at age 84. Interestingly, the share rises again to 6,25% for those aged 85 and older, indicating a notable portion of the population living beyond 85 years. This could suggest improvements in healthcare and living conditions, leading to increased longevity. The high share of young children necessitates the expansion of educational facilities such as schools and kindergartens to accommodate the growing number of young students. The noticeable share of the elderly population, particularly the spike in the 85+ age group, underscores the need for enhanced healthcare services, nursing homes, and social programs to support the aging population. The substantial working-age population points to a stable labor force, requiring policies that focus on employment opportunities, vocational training, and workforce development to harness the economic potential of this demographic, The increasing number of elderly individuals necessitates robust pension schemes and social security measures to ensure financial stability and well-being for the retired population.

5. CONCLUSIONS

An analysis of the availability of medical services in rural areas shows that its level depends on many factors. The most significant component of this problem is the medical institutions' network and staffing. Unfortunately, the downsizing trend of hospitals and outpatient clinics in rural areas is not abating. Of course, this contributes to the aggravation of the already difficult situation of rural residents. Increasing accessibility and improving the quality of medical services are the most critical factors influencing the life expectancy of the rural population (as well as the urban population). In addition, they are a primary condition for ensuring the principle of social equality in the realization of the right of every citizen to life and health care.

The primary goal of this study was to conduct a comprehensive analysis of demographic and educational indicators across regions of Kazakhstan, identifying key trends and disparities and determining each region's overall contribution. This goal was successfully achieved through the use of a detailed heatmap and correlation matrix, which provided valuable insights into Kazakhstan's socio-economic landscape from 2009 to 2022.

The heatmap revealed a consistent increase in the birth rate, indicating improved living conditions and healthcare services. Similarly, the population percentage grew, reflecting demographic expansion. There was also an increase in the percentage of immigrants, while the percentage of emigrants decreased, suggesting that Kazakhstan has become a more attractive destination for living and working. Employment rates showed a positive trend, but the workforce size significantly dropped, indicating shifts in labor market dynamics. Educational attainment showed variability, with the number of high school graduates peaking in 2019 and then declining, while the percentage of university graduates remained stable.

The correlation matrix provided insights into the interrelationships between various socio-economic indicators. A strong positive correlation between the birth rate and population growth was observed, indicating demographic expansion driven by improved living conditions. The matrix also highlighted the relationship between high school and university graduates, showing a generally positive correlation but with fluctuations indicating variability in educational attainment. Employment indicators exhibited a strong relationship, suggesting effective job creation policies. At the same time, the lack of a clear trend between emigrants and unemployment rates pointed to the influence of other macroeconomic factors.

Based on the analysis, several conclusions and recommendations can be drawn. The increasing birth rate and population growth suggest the need for continued investment in healthcare and living conditions to sustain this positive trend. Policy measures should focus on maintaining and enhancing the attractiveness of Kazakhstan as a destination for immigrants while addressing factors contributing to emigration. The fluctuations in high school graduate numbers highlight the need for targeted educational policies to ensure consistent preparation of students for higher education. Stable university graduate rates indicate the importance of maintaining and improving higher education standards to support the development of highly qualified specialists.

The positive trend in employment rates should be supported by policies aimed at expanding job opportunities, particularly in regions with declining workforce sizes. Vocational training and workforce development programs are essential to address the shifts in labor market dynamics and ensure a stable working-age population. The noticeable share of the elderly population, particularly those aged 85 and above, underscores the need for enhanced healthcare services, nursing homes, and social programs to support this demographic.

The analysis is based on available statistical data from 2009 to 2022, and any gaps or inaccuracies in the data may affect the conclusions drawn. While the analysis provides

a comprehensive overview, regional disparities may require more granular analysis to develop tailored policy recommendations. Additionally, the socio-economic landscape is dynamic, and factors such as economic policies, market conditions, and global trends can influence the indicators studied. Continuous monitoring and adaptation of strategies are necessary to address these changes effectively.

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