ELIT
Economic Laboratory Transition
Research Podgorica

*Montenegrin Journal of Economics*

**For citation:**

Kurmanov, N., Spankulova, L., Sabyrzhan, A., Kudebayeva, A., Kirichok, O. (2026), "Factors Influencing Income Inequality in the Regions of Kazakhstan", *Montenegrin Journal of Economics*, Vol. 22, No. 2, pp. 55-67.

# Factors Influencing Income Inequality in the Regions of Kazakhstan

NURLAN KURMANOV[1], LAZAT SPANKULOVA[2] (Corresponding author), ALI SABYRZHAN[3],
ALMA KUDEBAYEVA[4] and OXANA KIRICHOK[5]

[1]Professor, L.N. Gumilyov Eurasian National University, Astana, Kh. Dosmukhamedov Atyrau University, Atyrau, Kazakhstan, email: Kurmanov_NA@enu.kz, ORCID ID: https://orcid.org/0000-0002-3937-6940
[2]Professor, Al Farabi Kazakh National University, Almaty, Kazakhstan, email: liyazat.spankulova@kaznu.edu.kz, ORCID ID: https://orcid.org/0000-0002-1865-4681
[3]Professor, Karaganda Buketov University,Karaganda, Kazakhstan, email: alisher-aliev-79@mail.ru, ORCID ID: https://orcid.org/0000-0003-4619-9951
[4]Associate Professor, KIMEP University, Almaty, Kazakhstan, email: almak@kimep.kz, ORCID ID: https://orcid.org/0000-0002-1962-3924
[5]Caspian University, Almaty, Kazakhstan, e-mail: oxana.kirichok@bk.ru, ORCID ID: https://orcid.org/ 0000-0003-1059-4917

ARTICLE INFO

Received October 06, 2024
Revised from November 06, 2024
Accepted 20, December 06, 2024
Available online April 15, 2026

***JEL classification:*** D63, R13, R15

***DOI:*** 10.14254/1800-5845/2026.22-2.5

***Keywords:***

Income Inequality,
Gini Coefficient,
Regional Economic Disparities,
Panel Data Analysis,
Unemployment,
Poverty Rate.

ABSTRACT

*Income inequality remains a critical issue in Kazakhstan, despite overall improvements in living standards. This study aims to explore the impact of various economic factors on income inequality across 16 regions of Kazakhstan from 2001 to 2022, addressing gaps in existing research. The study's primary goal is to identify key variables, such as the funds coefficient, household consumption income, unemployment rate, inflation, and minimum subsistence level, that influence the Gini coefficient, which measures income inequality. The research utilizes panel data models, specifically applying fixed effects and random effects models, to conduct a comprehensive analysis of these factors. The data were sourced from official records, including those of the Bureau of National Statistics of the Republic of Kazakhstan. The study includes a Hausman test to determine the appropriate model for analysis. The findings reveal that the funds coefficient, household consumption income, unemployment levels, and poverty rate have a significant positive impact on income inequality, indicating that disparities between the wealthiest and poorest groups contribute to increasing inequality. Conversely, inflation exhibits a negative but minor effect on inequality, suggesting that price stability policies might mitigate income disparity slightly. These results underscore the importance of targeted economic policies to reduce income inequality and support the poorest population groups. The study's limitations include not accounting for migration flows and social factors like access to education, which could further influence inequality levels. The results can inform policy development aimed at improving social and economic conditions in Kazakhstan. Future research should incorporate social and institutional factors to provide a more precise analysis of the dynamics of inequality. This study contributes to the understanding of how macroeconomic variables shape regional income distribution in a transitioning economy.*

## INTRODUCTION

Income inequality and its impact on economic development are among the key issues attracting the attention of both scholars and policymakers. In Kazakhstan, where there is a significant disparity in income levels across various regions, this problem is particularly relevant. Despite substantial improvements in living standards since the 1990s, the Gini coefficient, which measures income inequality, has remained relatively high, with some regions experiencing particularly severe forms of poverty.

The issue of economic inequality is not only a social concern but also an economic one, as increasing inequality can adversely affect economic growth and social stability. Classical economic theories, beginning with the work of Kuznets, offer different understandings of the relationship between economic growth and inequality. On one hand, Kuznets argued that as an economy grows, inequality initially increases, then stabilizes, and eventually decreases. However, more recent studies (De Dominicis et al., 2008; Higgins & Williamson, 2002; Barro, 2000) suggest that this relationship is far more complex and may vary depending on the stage of economic development.

There are numerous studies (Asian Development Bank, 2023; Islyami, 2020; Turganbayev, 2016; Frey et al., 2013) focused on inequality in Kazakhstan, including analyses of migration, access to education and healthcare, fiscal policy, and its impact on poverty levels. However, there is still a lack of comprehensive research that examines the influence of key economic factors on income inequality. This study aims to fill this gap by modeling the influence of a range of economic variables on the Gini coefficient, which reflects the level of income inequality in Kazakhstan.

The goal of this study is to identify the economic factors affecting income inequality in Kazakhstan, using panel data from 16 regions over the period from 2001 to 2022. This study differs from previous research through its focus on a comprehensive analysis of key variables using panel data models, allowing for the consideration of temporal changes and regional characteristics. The primary research questions include: how does income inequality change under the influence of economic factors, and which variables have the most significant impact on the Gini coefficient in Kazakhstan? The study employs fixed effects and random effects models and conducts a Hausman test to determine the most appropriate model.

The structure of the article is organized as follows: the "Literature Review" section discusses previous studies and knowledge gaps; the "Materials and Methods" section outlines the methodology and data used in the study. The "Results" section presents findings based on panel regression models, while the "Discussion" section analyzes the results and offers recommendations for economic policy. The conclusion summarizes the key findings and outlines directions for future research.

## 1. LITERATURE REVIEW

The adverse political consequences of income inequality for both the state and society include undermining trust in government and public institutions, reducing social cohesion and civic engagement (Uslaner and Brown, 2005), increasing corruption, and hindering social mobility (Rothstein and Uslaner, 2005; Wilkinson and Pickett, 2009). This inequality can even lead to the escalation of protests and social unrest, as exemplified by the events in Kazakhstan in January 2022.

Despite the significant improvement in living standards in Kazakhstan since the 1990s, the official absolute poverty rate was 5.2% in 2022. Although the Gini index, which measures income inequality, decreased from 0.36 in 2001 to 0.263 in 2009, it subsequently rose to 0.294 in 2021. In 2022, 5.2% of households reported incomes below the subsistence level, with particularly high poverty rates in the Turkestan (9.7%) and Mangystau (8.1%) regions, while in the city of Astana, this figure was 1.9%.

The literature lacks consensus regarding the relationship between income inequality and economic growth. The classical theory proposed by Stiglitz (1969) posits a positive correlation between economic growth and inequality. Conversely, the political economy approach (Alesina and Perotti, 1996; Galor and Zeira, 1993) argues that income inequality negatively affects economic growth. The perspective offered by

Caraballo et al. (2017) suggests that the relationship between inequality and economic growth varies with the stage of economic development: it is negative in the early stages and becomes positive in later stages.

Kuznets' hypothesis (1955) describes the relationship between income and inequality as an inverted U-shape, where income inequality initially increases during the early stages of development, stabilizes, and then decreases as income continues to grow in developing countries. Early studies using cross-country datasets confirmed the Kuznets hypothesis, whereas later studies (Higgins and Williamson, 2002; Barro, 2000; De Dominicis et al., 2008) found that this relationship is complex and depends on factors such as sample size, data quality, and methods used to measure economic growth and income inequality.

Among the early works on transition economies is the study by Milanovic (1998), which describes the dramatic period of development from 1987 to 1996 in 18 former communist countries, including Kazakhstan, focusing on income, poverty, and inequality. Additionally, the work by Recepoğlu (2022) thoroughly examines the causal relationship between government expenditures, economic growth, and income inequality in CIS countries with transitional economies.

In large and geographically diverse countries like Kazakhstan, differences in regional economic development contribute significantly to overall socio-economic inequality (Oshchepkov, 2020; Milanovic, 2005; Sankar and Shah, 2003). Various studies have explored the comparative economic development and convergence of Kazakhstan's regions (Frey et al., 2013; Turganbayev, 2016), differences in quality of life and well-being (Asian Development Bank, 2023), as well as patterns of internal migration (Islyami, 2020). Nevertheless, many critical issues remain largely unresolved and insufficiently addressed.

Many authors aim to identify specific factors that can be managed to mitigate the effects of inequality. Education is often cited as one of the main factors in this regard (Anuarbek et al., Parker et al., 2020; Shahbaz et al., 2017; Kudasheva et al., 2015). Access to quality healthcare is also recognized as an important factor in reducing social inequality (Bhattacharjee et al., 2017; Kaestner and Lubotsky, 2016; Spankulova et al., 2020; Abikulova et al., 2013). The significance of fiscal measures and the development of financial institutions is also noted (Shahbaz et al., 2017; Johansson, 2016; Kyriacou et al., 2016; Burman, 2013; Kanseitova et al., 2012; Demirgüç-Kunt and Levine, 2009). Research by Agrawal (2007) emphasizes the importance of government spending on pensions and social welfare projects. Howie and Atakhanova (2014) also concluded that the resource boom in Kazakhstan contributes to reducing income inequality, taking into account changes in labor income, institutional quality, education levels, and healthcare expenditures. Studying household data from Kazakhstan for the period 2001–2005, Hare and Naumov (2008) found that the increase in oil exports left income inequality unchanged but reduced the number of people living in poverty.

Research on gender inequality in Kazakhstan is limited. Anuarbek et al. (2022) examined income statistics from 2011 to 2019, finding higher incomes among men but with a more uneven distribution compared to women. Akybayeva and Mussabekova (2023) identified a significant negative impact of traditional beliefs on women's participation in the labor force.

One of the aims of this study is to identify key factors that can reduce poverty and inequality in Kazakhstan. However, the complex relationship between income inequality and economic growth, characterized by periods of growth, decline, and stagnation, highlights the challenge of addressing these issues (Berg and Ostry, 2011). Therefore, developing countries like Kazakhstan must approach inequality reduction cautiously to avoid undermining incentives for growth.

A particular point of interest is the debate on the necessity of redistribution mechanisms (Arandarenko and Pavlovic, 2023). The neoliberal school, which has strongly influenced the leaders of former post-communist countries, asserted that market forces would naturally create opportunities for all, leading to reduced inequality along the Smith curve (Fukuyama, 2022; Slobodian, 2018; Lucas, 2002). However, empirical evidence suggests that this has not occurred in many post-socialist economies (Jalles, 2011).

A key question arises: is it necessary to combat inequality? In addressing this question, we refer to the theory of equal opportunities (Arneson, 1990; Dworkin, 2081a, 2081b; Cohen, 1989; Rawls, 1971). This theory postulates two categories of factors influencing individual achievements: circumstances beyond individual control and effort-related factors that fall within the realm of personal responsibility. Inequality in outcomes resulting from circumstances is referred to as inequality of opportunity. This type of inequality

is considered unjust and thus subject to correction through public social policy tools. Moreover, it is considered socially "harmful" as it erects barriers to the realization of human potential. Conversely, inequality in outcomes arising from differences in effort is seen as fair and socially beneficial. It ensures proper rewards for efforts made, motivates individuals to realize their potential, and thus contributes to an overall increase in aggregate social outcomes. Our study specifically aims to address inequality of opportunity rather than inequality of effort.

Thus, the literature review reveals a lack of comprehensive research focused on the combined effects of various factors on inequality and poverty in Kazakhstan. Given the transitional nature of Kazakhstan's economy, there is a need for studies that offer concrete measures for addressing these challenges.

## 2. MATERIALS AND METHODS

The study utilizes panel data from 16 regions of Kazakhstan for the period from 2001 to 2022. The data source is the official statistical databases of the Bureau of National Statistics, Agency for Strategic Planning and Reforms of the Republic of Kazakhstan. The observations include key economic variables that reflect the socio-economic status of the regions and levels of income inequality.

**Table 1.** Variables Selected for Model Construction

| *Variable Code* | *Variable* | *Source* |
|---|---|---|
| Gini | Gini coefficient by 10 percent (decile) groups | BNS |
| Fund | Funds coefficient (ratio of the top 10% to the bottom 10% of the population) | BNS |
| ConsInc | Household income (used for consumption) per capita, KZT | BNS |
| Infl | Consumer Price Index, % | BNS |
| Unempl | Unemployment rate, % | BNS |
| PrMin | Minimum subsistence level, KZT | BNS |

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Source: a) Compiled by the authors; b) BNS – Bureau of National Statistics, Agency for Strategic Planning and Reforms of the Republic of Kazakhstan

For the model construction, the following independent variables were selected (Table 1):

- Gini – The Gini coefficient, which measures the level of income inequality.
- Fund – The funds coefficient, representing the income ratio between the top 10% of the population and the bottom 10%.
- ConsInc – Household income (used for consumption).
- Infl – Inflation, measured as the annual rate of price growth in percentage.
- Unempl – Unemployment rate, reflecting the share of the economically active population without work.
- PrMin – Minimum subsistence level, representing the minimum income needed to meet basic needs - official poverty line in Kazakhstan.

The variables were lagged by one period, allowing for the consideration of the delayed effect of these factors on income inequality. Lagging the variables is justified as many economic processes (e.g., changes in the unemployment rate or inflation) can impact inequality with a time delay.

*Data Collection and Processing*.

Data were collected from official reports and statistical databases. Initial data processing included checking for missing and anomalous values. Missing data were interpolated based on average values for the corresponding period or region. All data were organized and structured into a panel format, where each row represents an observation for a specific region in a given year.

*Analysis Methods*

To analyze the impact of economic factors on the Gini coefficient, panel regression models were used, including the following methods:

- Pooled OLS (Ordinary Least Squares). This model assumes that all regions have the same characteristics and performs estimation based on pooled data without accounting for individual regional differences.
- Fixed Effects Model (FE). The fixed effects model was used to account for time-invariant characteristics of each region (e.g., institutional features, cultural factors). This allowed for the elimination of bias caused by such factors and enabled the assessment of the influence of variables that change over time.
- Random Effects Model (RE). The random effects model assumes that individual differences between regions are random and uncorrelated with the independent variables. This approach captures variations between regions as random effects, independent of the other factors.

A panel data model with lagged variables was employed to assess the impact of key economic factors on the Gini coefficient.

$$x'_{it} = (Gini_{it-1}, Fund_{it-1}, Unempl_{it-1}, Infl_{it-1}, ConsInc_{it-1}, PrMin_{it-1}, 1). \quad (1)$$

The vector of independent variables $x'_{it}$ includes lagged values of the variables: $Gini_{it-1}$ (Gini coefficient from the previous period), $Fund_{it-1}$ (funds coefficient from the previous period), $Unempl_{it-1}$ (unemployment rate), $Infl_{it-1}$ (inflation), $ConsInc_{it-1}$ (household income), $PrMin_{it-1}$ (minimum subsistence level).

Lagging the variables is justified by the need to account for the time delay in economic processes that can influence the level of income inequality. The constant term (1) accounts for a fixed effect associated with unobserved factors.

To select the most appropriate model, the Hausman test was applied. This test helps determine whether a fixed effects or random effects model is more suitable for data analysis. It checks for systematic differences between the coefficient estimates of the two models. A significant result from the Hausman test suggests using the fixed effects model. If the differences are insignificant, preference is given to the random effects model.

The models were estimated using Stata software, which enabled efficient panel data analysis and interpretation of results. The main findings are presented in Tables 3 and 4. All independent variables were tested for multicollinearity using correlation coefficients and were also checked for heteroscedasticity.

Thus, the selected methods and analytical tools enable conclusions about the impact of economic factors on income inequality in Kazakhstan, which are discussed in detail in the respective sections of the paper.

## 3. RESULTS

Table 2 provides information on the key variables used in the study. These variables measure various economic factors that influence the Gini coefficient, which is a measure of income inequality. The data cover the period from 2017 to 2021 and include 352 observations across 16 regions of Kazakhstan (see Table 1 in the Appendix).

**Table 2**. Descriptive Statistics

| *VarName* | *Obs* | *Mean* | *SD* | *Min* | *Max* |
|---|---|---|---|---|---|
| Gini | 352 | 0.267 | 0.042 | 0.16 | 0.43 |
| Fund | 352 | 5.475 | 1.402 | 2.84 | 11.11 |
| ConsInc | 352 | 33395.847 | 22545.752 | 3421.50 | 105896.08 |
| Infl | 352 | 108.400 | 4.055 | 103.20 | 127.10 |
| Unempl | 352 | 6.394 | 1.946 | 4.40 | 13.90 |
| PrMin | 352 | 17474.017 | 10855.398 | 3685.00 | 52367.00 |

Source: Compiled by the authors

The average Gini coefficient is 0.267, ranging from 0.16 to 0.43, indicating a moderate level of income inequality in Kazakhstan. The data presented in Figure 1 of the Appendix shows that the Gini coefficient varies across the regions of Kazakhstan and over the years. For example, in the Atyrau region in 2002, the coefficient was 0.43, indicating high inequality, while in the Mangystau region in 2009, it was 0.16, indicating lower inequality. In other regions, such as the Akmola and Almaty regions, the coefficient remains relatively stable, suggesting persistent income inequality in these areas.

The average value of the fund's coefficient is 5.475, indicating significant disparity between the top 10% and the bottom 10% of the population. In some regions, such as the Aktobe region in 2001, the coefficient was very high (11.11), indicating severe economic inequality. In contrast, in regions like the Mangystau region in 2017, the value was much lower (2.84), reflecting a more even income distribution.

The average household consumption income is 33395.847 KZT per capita, with a large standard deviation, indicating significant regional differences in income levels across Kazakhstan. For instance, in Almaty city in 2022, the average income reached 105,896 KZT, the highest among all regions. Meanwhile, in regions like the Zhambyl region, this indicator is lower, highlighting substantial disparities in living standards across Kazakhstan.

The inflation rate in the sample is relatively stable, averaging 108.4%, which suggests a controlled rate of price growth.

The average unemployment rate is 6.394%, indicating a relatively low level of unemployment in some regions but a significant level in others during certain years.

The average minimum subsistence level in the sample is 17474.017 KZT, reflecting the basic needs across different regions.

Table 3 presents the estimation results of the economic factors influencing the Gini coefficient using three methods: Pooled OLS (Ordinary Least Squares), Fixed Effects model, and Random Effects model.

**Table 3**. Estimation Results

| | *Pooled OLS* | *Fixed efefcts* | *Random effects* |
|---|---|---|---|
| VARIABLES | Gini | Gini | Gini |
| $Gini_{(t-1)}$ | 0.385*** | 0.206** | 0.385*** |
| | (0.0806) | (0.0827) | (0.0806) |
| $Fund_{(t-1)}$ | 0.00896*** | 0.00830*** | 0.00896*** |
| | (0.00225) | (0.00229) | (0.00225) |
| $ConsInc_{(t-1)}$ | 1.33e-06*** | 1.37e-06*** | 1.33e-06*** |
| | (1.92e-07) | (2.39e-07) | (1.92e-07) |
| $Infl_{(t-1)}$ | -0.000941*** | -0.000562* | -0.000941*** |
| | (0.000334) | (0.000324) | (0.000334) |
| $Unempl_{(t-1)}$ | 0.00306*** | 0.00764*** | 0.00306*** |
| | (0.00101) | (0.00118) | (0.00101) |
| $PrMin_{(t-1)}$ | -2.27e-06*** | -1.86e-06*** | -2.27e-06*** |
| | (3.88e-07) | (4.68e-07) | (3.88e-07) |
| Constant | 0.189*** | 0.162*** | 0.189*** |
| | (0.0380) | (0.0367) | (0.0380) |
| Observations | 336 | 336 | 336 |
| R-squared | 0.771 | 0.744 | 0.771 |
| Standard errors in parentheses | | | |
| *** p<0.01, ** p<0.05, * p<0.1 | | | |

Source: Compiled by the authors

All three models (Pooled OLS, Fixed Effects, and Random Effects) indicate a positive and significant impact of the fund's coefficient on the Gini coefficient, with high levels of significance ($p < 0.01$). This means that an increase in the gap between the top 10% and the bottom 10% of the population leads to a rise in income inequality. The coefficient ranges from 0.206 in the Fixed Effects model to 0.385 in the Pooled OLS and Random Effects models.

All three models also show that the Gini coefficient from the previous period ($Gini_{(t-1)}$) positively affects the current Gini coefficient, indicating a certain inertia in the level of inequality. This means that the previous level of inequality influences the current one.

The positive and significant effect of the fund's coefficient on the Gini coefficient ($p < 0.01$) across all models suggests that an increase in the disparity between the most affluent and the least affluent segments of the population contributes to a rise in income inequality.

Household consumption income also shows a significant positive impact on the Gini coefficient across all models ($p < 0.01$). The very small coefficients suggest that while an increase in per capita consumption income does affect the level of inequality, this effect is minor in magnitude (coefficients range from 1.33e-06 to 1.37e-06).

The impact of inflation on the Gini coefficient is negative and statistically significant, although with low coefficients (values range from -0.000562 to -0.000941). This indicates that inflation can reduce the level of income inequality, but the effect is minor in magnitude.

The coefficients range from 0.00306 to 0.00764, indicating a consistent effect of unemployment on inequality. The positive and significant impact of unemployment on the Gini coefficient shows that an increase in the unemployment rate is associated with a rise in income inequality.

The effect of the poverty rate is also positive and significant across all models ($p < 0.01$). This confirms that an increase in the proportion of the poor population leads to a rise in income inequality, which is logical.

The value of the constant is also statistically significant, indicating a baseline level of inequality even in the absence of the model's variables.

The analysis results show that the key factors influencing income inequality in Kazakhstan are the funds coefficient, consumption income, unemployment levels, inflation, and poverty. These variables have a significant impact on the Gini coefficient, as confirmed by all three estimation models.

The Hausman test (Table 4) is used to choose between two primary panel data models: the Fixed Effects model (FE) and the Random Effects model (RE). Fixed Effects (FE) assumes that individual (regional) characteristics affecting the Gini coefficient are constant and fixed over time. Random Effects (RE) considers these characteristics as random and uncorrelated with the variables included in the model.

**Table 4**. Hausman Test

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Test:  Ho:  difference in coefficients not systematic

              chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                      =       58.55
            Prob>chi2 =      0.0000
            (V_b-V_B is not positive definite)
```

Source: Compiled by the authors

According to Table 4, the p-value of the Hausman test is 0.000. Since the p-value is less than 0.01, we reject the null hypothesis at the 1% significance level. This means that at the 1% level, random effects may be consistent and efficient, and thus the RE model can be used.

## 4. DISCUSSION

The findings of this study shed light on the key economic factors influencing income inequality in Kazakhstan, providing a deeper understanding of their impact in the regional context. Based on the analysis of panel data across 16 regions from 2001 to 2022, significant variables such as the funds coefficient, household consumption income, unemployment rate, inflation, and minimum subsistence level were identified. These factors significantly affected the Gini coefficient, indicating that economic inequality in Kazakhstan is closely linked to macroeconomic indicators that shape income distribution.

Our research demonstrated that the funds coefficient has a positive impact on the Gini coefficient, confirming the hypothesis that an increase in the gap between the wealthiest and the least affluent segments of the population contributes to rising income inequality. This finding is consistent with previous studies (Uslaner and Brown, 2005; Rothstein and Uslaner, 2005), which also note the negative impact of economic inequality on social stability. Moreover, the positive effect of household consumption income on income inequality, as revealed in our study, underscores the need to consider consumer behavior when formulating measures to reduce inequality.

Interestingly, inflation showed a negative impact on the level of inequality, although this effect was minor in magnitude. This aligns with theoretical assumptions (Barro, 2000), suggesting that inflation may help to curb inequality by reducing the real incomes of the wealthiest segments of the population. However, our analysis indicates that this effect remains limited and warrants further investigation, particularly considering regional specificities.

A key finding of this study is the confirmed relationship between unemployment and income inequality. The results showed that an increase in the unemployment rate leads to greater economic disparity, which supports the conclusions of Alesina and Perotti (1996) and Galor and Zeira (1993) that unemployment exacerbates economic inequality. This highlights the importance of developing employment programs and support mechanisms for the working population as a crucial tool in addressing inequality (Burman, 2013; Shahbaz et al., 2017).

This study has advanced scientific knowledge by offering a comprehensive analysis of the influence of macroeconomic factors on income inequality in Kazakhstan based on panel data. We also emphasized the significance of factors such as the funds coefficient and household consumption income, allowing for more precise policy recommendations aimed at reducing inequality. It is important to note that despite the significance of the findings, our study has limitations, including the lack of consideration for migration flows and social factors, which may also affect income inequality.

The practical application of these results can be directed toward the development of targeted social support programs and measures to improve employment, especially in regions with high unemployment rates and economic disparities. Future research should include additional social factors, such as access to education and healthcare, as well as consider the impact of migration processes on the economic development of regions.

## CONCLUSION

This study has identified key economic factors influencing income inequality in Kazakhstan. The primary drivers of inequality include the gap between the wealthiest and the least affluent segments of the population (funds coefficient), household consumption income, the unemployment rate, and the proportion of the poor population. These factors consistently affect the Gini coefficient across different regions of the country. However, contrary to expectations, inflation did not show a significant impact on income inequality. This may be attributed to economic policies aimed at price stabilization and relatively low levels of inflation during the study period.

The Hausman test indicated that, within the framework of the panel data model, the Random Effects (RE) model is more appropriate at the 1% significance level, while the Fixed Effects (FE) model may be preferred at the 10% significance level. This suggests the presence of both fixed and random effects in the analyzed data, highlighting the complexity of the economic processes influencing income inequality.

Despite the findings, the study has several limitations. The use of only macroeconomic indicators may not fully capture all social and institutional factors influencing income inequality. Additionally, while the panel data includes all regions of Kazakhstan, it does not account for potential migration flows and their impact on regional economic development.

Future research is recommended to explore the impact of other social factors, such as access to education and healthcare, which, as shown in other studies (Kudasheva et al., 2015; Spankulova et al., 2020), can significantly influence the reduction of inequality. Furthermore, it is essential to consider gender inequality, which also affects the overall picture of economic disparity (Anuarbek et al., 2022).

Thus, to gain a more comprehensive understanding, future studies should incorporate not only economic but also social aspects, as well as consider the impact of various government programs aimed at reducing inequality and improving the population's living standards.

## ACKNOWLEDGMENTS

This research has been funded by the Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan (Grant No. AP19680043).

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## APPENDIX

**Figure 1A**. Gini coefficients by regions

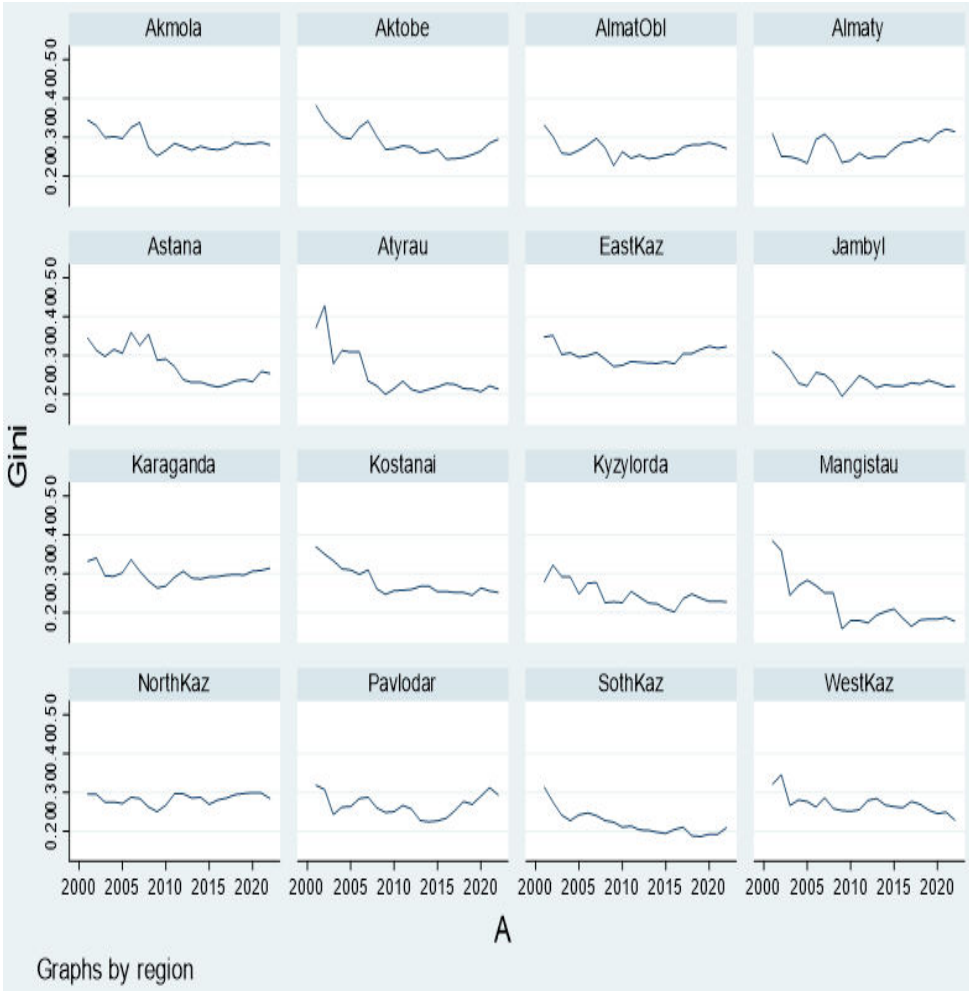

**Figure 2A**. Funds by regions

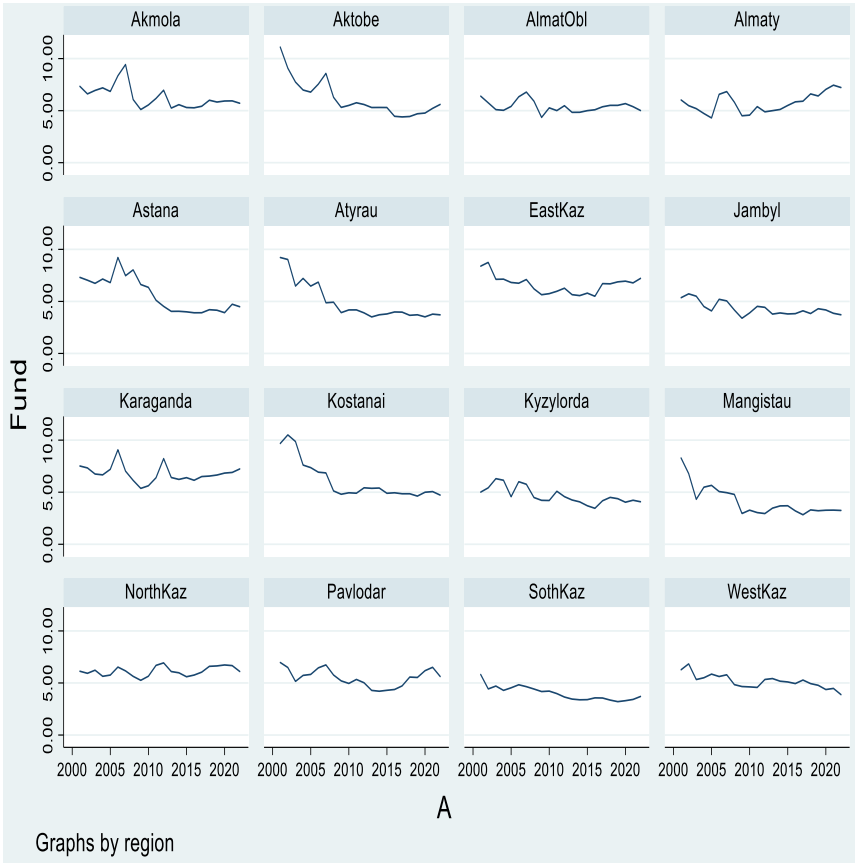


**Figure 3A**. Household Income by regions

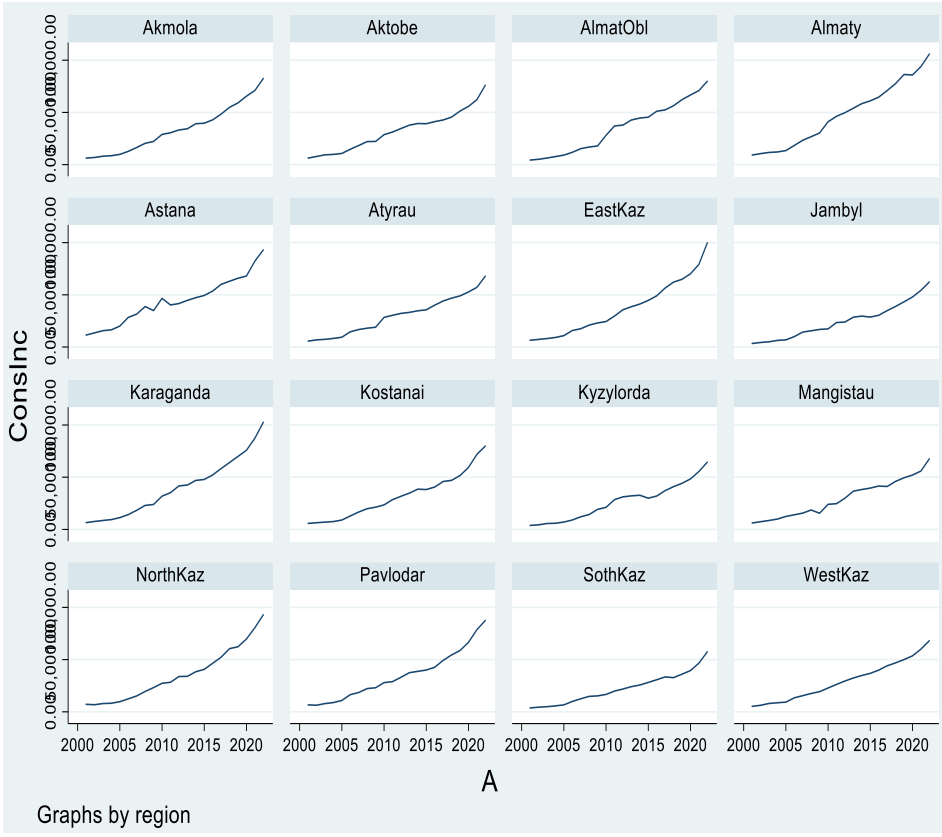

**Figure 4A**. Inflation rate by regions

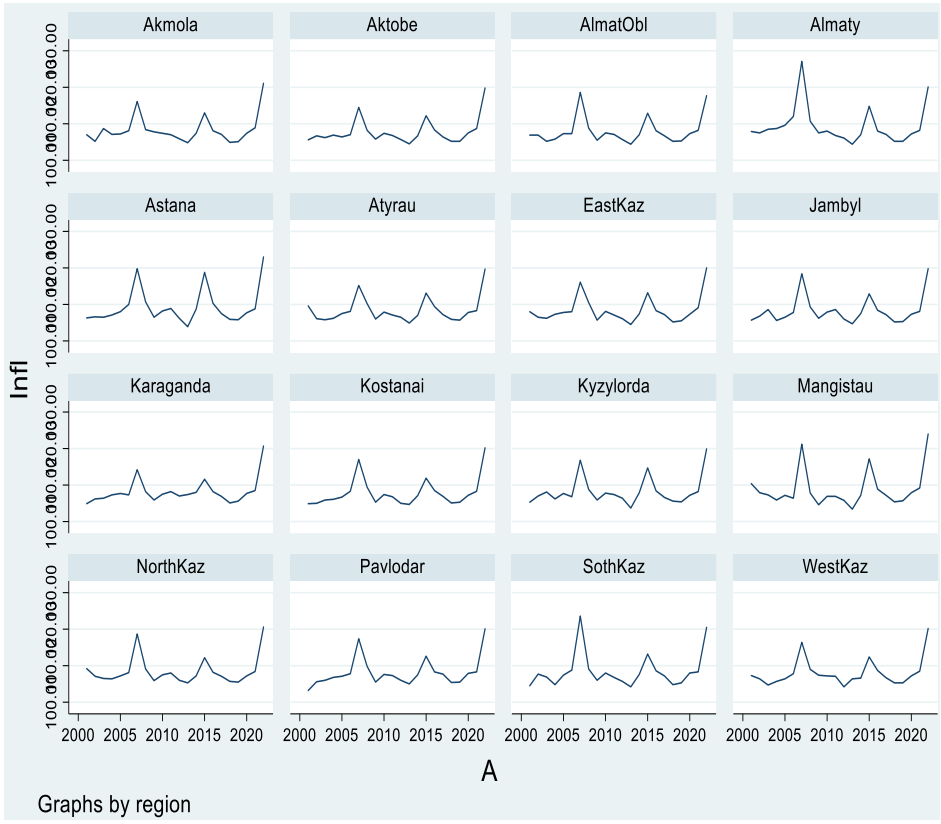


**Figure 5A**. Unemployment rate by regions