Income differentiation in Kazakhstan: an in-depth examination of its economic and social drivers

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Abstract. This study comprehensively identifies and quantitatively assesses the factors influencing income differentiation in Kazakhstan, demonstrating the multifaceted relationships between income inequality and various economic indicators. Utilizing quantitative research methodology, the investigation employs an Autoregressive Distributed Lag model to analyze the impact of GDP, real income, social aid, migration, and inflation on the Gini index of Kazakhstan from 2001 to 2022. Data was sourced from the Bureau of National Statistics, ensuring a robust and reliable foundation for the analysis. The investigation highlights the relevance of addressing income inequality in pursuing economic growth balanced with social justice, emphasizing global commitment to sustainable development goals. The results show that GDP growth and migration contribute to reducing income inequality, whereas increases in real income and, unexpectedly, social assistance are associated with higher inequality levels. Inflation's impact on income inequality was statistically insignificant, suggesting its effects may be ambiguous depending on other conditions. Overall, the findings advocate for developing multilevel strategies and policies aimed at reducing income inequality, encompassing economic measures, social investments, and improved labor market regulation to achieve more equitable and sustainable economic development in Kazakhstan.

Keywords: income inequality, economic growth, Autoregressive Distributed Lag, social aid, Gini index.

Introduction

Income inequality, as a socio-economic category, is always in the field of view of most foreign and domestic researchers, as it is one of the most important indicators reflecting the country's social situation.

Income inequality can have both positive and negative effects on economic growth. A certain level of inequality can stimulate investment and economic activity. On the other hand, excessive inequality deepens social gaps and can slow down growth by reducing consumer demand and limiting access to education and health care for the lower strata of the population.

Inequality that arises due to the distribution of income and benefits of the population manifests itself differently in different states in terms of scale and different periods. Moreover, today, income differentiation is a complex socio-economic phenomenon that does not lend itself to a single analysis, interpretation and assessment.

This study aims to comprehensively identify and quantitatively assess factors influencing the differentiation of incomes of the population of the Republic of Kazakhstan.

In modern conditions, the study of income inequality is of particular relevance in the context of finding a balance between economic growth and social justice, as well as in the light of the desire to achieve sustainable development goals adopted by the world community. Understanding the main drivers of income inequality allows governments and international organizations to develop targeted policies and programs to reduce inequality. This includes tax policies, social benefits, educational initiatives and market regulations.

Today, Kazakhstan is a country catching up in development regarding the scale of economic and social inequality, but territorial equalization remains one of the most important tasks.

After gaining independence, the Republic of Kazakhstan, like many post-Soviet countries, implemented a policy of shock therapy and a series of economic reforms, after which there was a sharp increase in the level of well-being of the top 10% of the population by income. The radical socio-economic changes of the 1990s led not only to a sharp drop in the average standard of living of the population, but also to an exceptionally strong polarization of society. Non-monetary factors of economic inequality due to unequal opportunities between the super-rich and people experiencing poverty were converted into monetary ones. Consequences that still affect the country's economy.

Therefore, the most important conditions for developing effective social policy are analyzing income and consumption differentiation and finding ways to reduce it to a socially acceptable level.

There are many methods and indicators for measuring inequality and income differentiation. However, the Gini coefficient is important in determining social inequality and poverty in a society. It synthesizes information about the income distribution across the entire population into a single numerical measure that is easy to interpret. The coefficient ranges from 0 to 1, where 0 indicates absolute equality (every member of society receives the same income) and 1 indicates absolute inequality (all income is concentrated in one person).

The Gini coefficient allows you to compare the level of inequality between different countries and regions and track changes in inequality over time within a country, making it an important tool for analyzing trends and the effectiveness of socio-economic policies.

The figure below shows the dynamics of the Gini coefficient in the Republic of Kazakhstan from 2001 to 2022.
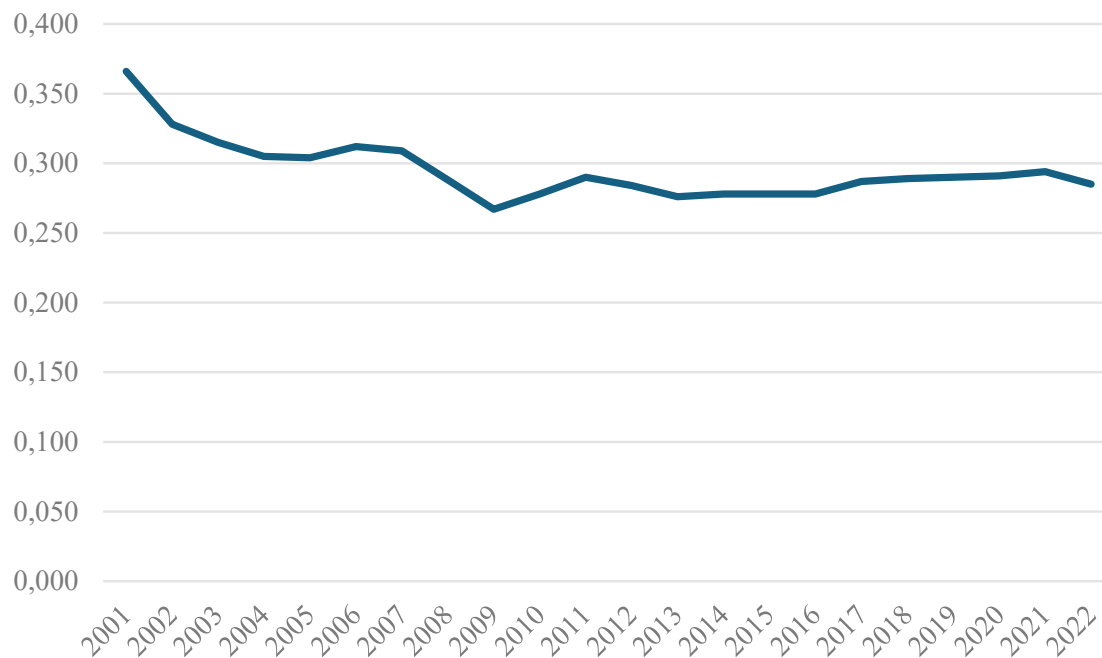

Figure 1 – Gini coefficient in the Republic of Kazakhstan, 2001-2022
Source: Compiled by authors based on the data from [1]

The data shows that in 2001, the Gini coefficient was 0,366, indicating a relatively high level of income inequality. Over the next few years, inequality decreased: the coefficient decreased and reached its minimum in 2009 at 0,267. This may reflect the effectiveness of government economic and social policies in reducing income inequality.

After 2009, the Gini coefficient experienced slight fluctuations. Generally, it tended to stabilize in the range from 0,26 to 0,29, which indicates that the achieved level of income inequality is maintained without significant changes in subsequent years. In 2020, the Gini coefficient increased slightly to 0,291, which may be due to the economic consequences of the COVID-19 pandemic affecting household incomes. In 2022, the coefficient dropped to 0,285, which may indicate the beginning of economic recovery and a reduction in income inequality after the pandemic.

Literature review

A range of economic indicators have been found to influence income inequality. Trapeznikova (2019) highlights the importance of understanding the dimensions of economic inequality, including pre-tax and after-tax income, consumption, and wealth [2]. Maxwell (1989) and

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Roine et al. (2009) both emphasize the role of industrial employment shifts and periods of high economic growth in increasing income inequality [3, 4]. The impact of international trade on income inequality is also noted, with Roser & Cuaresma (2016) finding that imports from developing countries can exacerbate inequality [5]. Mo (2000) and Rubin & Segal (2015) both explore the relationship between income inequality and economic growth, with Mo (2000) suggesting that income inequality has a significant negative effect on GDP growth and Rubin & Segal (2015) finding that the income of top income groups is more sensitive to growth [6, 7]. Wang (2008) and Mulholland & Shupe (2018) both identify a range of factors influencing income inequality, including growth, institutional arrangements, income redistribution, and changes in the labor force composition [8, 9].

The relationship between economic growth and income inequality is complex and multifaceted. While some studies have found a negative association between income inequality and economic growth [10, 6, 11], others have identified a positive association, particularly for the top income groups [7, 12]. The shape of the income distribution, with inequality at the top end being positively associated with growth and inequality lower down being negatively related to growth, has also been highlighted as a key factor [12]. The level of equality of opportunity, as measured by intergenerational mobility, has been proposed as a mediating factor in this relationship, with lower intergenerational mobility exacerbating the negative impact of income inequality on growth [13]. Furthermore, the gap between low-income households and the rest of the population has been identified as a significant factor, with policies to reduce this gap being crucial for both social outcomes and long-term growth [14].

Dabla-Norris et al. (2015) highlighted the negative impact of income inequality on economic growth, with the former emphasizing the role of human capital and the latter advocating for policies that raise the income share of the poor and middle class [15]. McCall & Percheski (2010) and Gregorio & Lee (2002) further explore the drivers of income inequality, with the former discussing the role of top earners and the latter emphasizing the importance of education and government social expenditure [16, 17]. Young (2013) and Cornia (2004) both discuss the impact of migration and globalization on income inequality, with the former highlighting the urban-rural gap and the latter discussing the rise in inequality in the context of liberalization and globalization [18, 19]. Luebker (2011) and Roine et al. (2009) discuss the role of taxes and transfers in reducing income inequality, with the former emphasizing their potential impact and the latter providing evidence of their effectiveness [20, 4].

This literature review illustrates the diverse and interconnected factors contributing to income inequality, from macroeconomic trends and policy responses to globalization and demographic shifts. The results highlight the complexity of addressing income inequality and the need for multifaceted approaches that take into account economic, social and global dimensions.

Methodology

The study uses a quantitative research method to examine the impact of some indicators on the Gini index. The method involves collecting numerical data and employing statistical techniques to test hypotheses about the relationships among variables.

The research design is non-experimental and correlational, as it aims to identify the strength and direction of associations between the dependent variable (Gini index) and independent variables (GDP, Real income, Social aid, Migration, and Inflation). The design involves using secondary data for Kazakhstan from 2001 to 2022. The data was sourced from Bureau of National Statistics of Agency for Strategic planning and reforms of the Republic of Kazakhstan [1].

Based on the research methodology, the model specification for the empirical investigation into the determinants of Gini index in Kazakhstan can be articulated as follows:

$$Gini_t = \beta_0 + \beta_1 \cdot GDP_t + \beta_2 \cdot Real_{income\,t} + \beta_3 \cdot Social_{aid\,t} + \beta_4 \cdot Migration_t + \beta_5 \cdot Inflation_t + \varepsilon_t$$

Where:
– $Gini_t$ is the Gini coefficient for 10 percent (decile) groups (index) at time *t*,
– GDP_t is nominal GDP in current prices (billion tenge) at time *t*,
– $Real_{income\,t}$ is index of real money income of the population (index) at time *t*,
– $Social_{aid\,t}$ is number of recipients of assigned state social aid (thousand people) at time *t*,
– $Migration_t$ is balance of external migration of the population of the Republic of Kazakhstan (thousand people) at time *t*,
– $Inflation_t$ is index of prices and tariffs for consumer goods and services (index) at time *t*,
– β_0 is the constant,
– β_1, β_2, β_3, β_4, β_5 are the coefficients of the respective independent variables,
– ε_t is the error term at time *t*.

This model aims to quantify the relationships between the Gini index and its determinants, including GDP, real money income, social aid, migration, and inflation, over the period of 2001 to 2022. Applying the OLS estimation technique will allow for assessing the significance and strength of these relationships. The analysis was carried out using STATA 17 software.

Results and discussion

Table 1 presents descriptive statistics of the variables used in the model.

Table 1 – Descriptive Statistics

Variable	Obs	Mean	Std. dev.	Min	Max
Gini	22	0,295	0,022	0,267	0,366
GDP	22	34996,58	28795,84	3250,593	103765,5
Real_income	22	106,988	5,432	96,866	118,9
Social_aid	22	781,441	19,414	748,378	844,314
Migration	22	-10,824	26,886	-88,162	33,041
Inflation	22	107,982	3,042	104,8	118,8
Note: Compiled by authors using Stata 17					

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The average Gini index over the observed period is 0,295, which may indicate a moderate level of income inequality, given that the Gini coefficient ranges from 0 (perfect equality) to 1 (perfect inequality). A standard deviation 0,022 indicates little variability in the Gini coefficient among observations. The mean GDP is medium at about 35000 billion tenge, showing that the data perhaps covers an economy of medium size. The standard deviation of 28795,84 billion tenge indicates substantial yearly economic fluctuations. The GDP ranged from a low of 3250 billion tenge in 2001 to a high of 103765,5 billion tenge in 2022, denoting periods of economic contraction and expansion. The index of real money income has a mean value of 106,988, which might suggest that real incomes have consistently increased. The standard deviation is slight (5,4%), which indicates that growth was relatively stable over time. The inflation rate's mean value is about 8%, with a standard deviation of 3%, indicating variable inflationary periods. The minimum inflation rate recorded is 4,8%, and the maximum is 18,8%, suggesting that the economy has experienced moderate and high inflation times. The balance of external migration shows a negative mean, suggesting a net outflow in the sample.\The first stage of the analysis is to test the variables for stationarity. This is necessary to ensure that the stochastic properties of the analyzed time series, such as the mean and variance, do not change over time, which is a prerequisite for many statistical forecasting and modeling methods. Stationary time series allow the use of standard estimation and inference techniques because they assume that relationships found in historical data will persist into the future. Otherwise, if the data is non-stationary, problems with model estimation and predictions may arise as changes in statistical properties can lead to incorrect assumptions and conclusions. Nonstationarity can also lead to spurious correlations between variables, making the analysis results less reliable. Therefore, testing for stationarity and then transforming the data if necessary is at the core of reliable time series analysis.

Table 2 – Results of Unit Root Test at Levels

Variable	ADF Statistics	Critical Values (1%)	Critical Values (5%)	Critical Values (10%)
Gini	No constant	-2,66	-1,95	-1,6*
	Drift	-2,539***	-1,729**	-1,328*
	Trend	-4,38	-3,6**	-3,24*
GDP	No constant	-2,66	-1,95	-1,6
	Drift	-2,539	-1,729	-1,328
		-4,38	-3,6	-3,24
Real_income	No constant	-2,66	-1,95	-1,6
	Drift	-2,539	-1,729**	-1,328*
	Trend	-4,38	-3,6	-3,24
Social_aid	No constant	-2,66	-1,95	-1,6
	Drift	-2,539	-1,729	-1,328
	Trend	-4,38	-3,6	-3,24

Migration	No constant	-2,66***	-1,95**	-1,6*
	Drift	-2,539***	-1,729**	-1,328*
	Trend	-4,38	-3,6**	-3,24*
Inflation	No constant	-2,66	-1,95	-1,6
	Drift	-2,539***	-1,729**	-1,328*
	Trend	-4,38	-3,6	-3,24*
Notes: Compiled by authors using Stata 17, *, ** and *** indicate no unit root at 1%, 5% and 10% respectively.				

Unit root tests are used to determine whether a time series is stationary or not. If a time series is nonstationary, this means that its statistical characteristics, such as the mean and variance, can change over time. Therefore, it is necessary for the series to be stationary to analyze and make reliable forecasts.

Table 2 presents the Augmented Dickey-Fuller (ADF) unit root test results for each variable at levels, with different model specifications: no constant, with drift, and with trend. The ADF statistics are compared against the critical values for different significance levels (1%, 5%, and 10%). Gini has ADF statistics lower than the critical values at the 1% significance level when a drift is included, suggesting that Gini is stationary at levels. For GDP, on the other hand, the ADF statistics are not lower than the critical values across all specifications, indicating the presence of a unit root, hence the variable is non-stationary at levels. Real_income shows mixed results; it is non-stationary at levels when no constant is included, but results are inconclusive with drift specification. Social_aid's ADF statistics are higher than the critical values in all cases, suggesting that it is non-stationary at levels. Migration is stationary at levels across all model specifications as the ADF statistics are lower than the critical values. Inflation is non-stationary at levels when no constant is included but is stationary when drift is included.

These results indicate that some of the economic indicators (GDP, Real_income, Social_aid) require further transformations, such as differentiation, to achieve stationarity before being used in time series models.

Table 3 – Results of Unit Root Test at First Difference

Variable	ADF Statistics	Critical Values (1%)	Critical Values (5%)	Critical Values (10%)
DGDP	No constant	-2,66	-1,95	-1,6*
	Drift	-2,552***	-1,734**	-1,33*
	Trend	-4,38	-3,6**	-3,24*
DReal_income	No constant	-2,66***	-1,95**	-1,6*
	Drift	-2,552***	-1,734**	-1,33*
	Trend	-4,38***	-3,6**	-3,24*
DSocial_aid	No constant	-2,66***	-1,95**	-1,6*
	Drift	-2,552***	-1,734**	-1,33*
	Trend	-4,38***	-3,6**	-3,24*
Notes: Compiled by authors using Stata 17, *, ** and *** indicate no unit root at 1%, 5% and 10% respectively.				

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Table 3 displays the ADF test results after the first differencing of the variables, which is done to achieve stationarity. DGDP is stationary at first difference as the ADF statistic is lower than the critical value at the 1% significance level when drift is included. For DReal_income, the variable is stationary at first difference across all model specifications since the ADF statistics are lower than the critical values at the 1% level. DSocial_aid is also stationary at first difference with the ADF statistics well below the critical values at the 1% level. The original level variables of GDP, Real_income and Social_aid, which were non-stationary at levels, become stationary after first differencing, implying they are integrated of order one, I(1). This stationarity at first difference is crucial for further analysis, such as cointegration tests and regression modeling.

Table 4 – Correlation matrix

	Gini	GDP	Real_income	Social_aid	Migration	Inflation
Gini	1					
DGDP	-0,456	1				
DReal_income	0,641	-0,567	1			
DSocial_aid	0,096	0,606	-0,291	1		
Migration	-0,531	-0,125	0,129	-0,372	1	
Inflation	0,011	-0,049	0,323	-0,328	0,251	1
Note: Compiled by authors using Stata 17						

The next stage of the analysis is to check the multicollinearity of the explanatory variables. Testing for multicollinearity is important because high correlations between independent variables can make estimates of regression coefficients unstable. Small changes in data can cause large changes in odds, making them unreliable.

As can be seen from Table 4, there is no multicollinearity between the explanatory variables in the data sample. This suggests that these variables can be used in one regression model.

Table 5 – Interpretation of the ARDL Model Estimate

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Interpretation
DGDP	−0,000000605	0,000000139	-4,34	0,001	Highly significant; GDP negatively affects the Gini index.
DReal_income	0,00187	0,00059	3,17	0,006	Highly significant; real income positively affects the Gini index
DSocial_aid	0,00063	0,00018	3,46	0,003	Highly significant; social aid positively affects the Gini index
Migration	-0,00056	0,00013	-4,36	0,001	Highly significant; migration negatively affects the Gini index

Inflation	0,00093	0,00093	1	0,335	Insignificant; inflation does not significantly affect the Gini index
C	-0,478	0,187	-2,55	0.022	Highly significant; suggests other constant factors negatively affecting the Gini index
Notes: Compiled by authors using Stata 17, R-squared = 0,82; F(5, 15) = 13,73 [0.0000]					

Table 5 presents an estimate of an autoregressive distributed lag (ARDL) model that examines the impact of various variables on the Gini index. The selected model is ARDL (1, 0, 0, 0, 0, 0), indicating the lags used for each variable.

The negative coefficient of the DGDP variable and its high significance indicate that GDP growth leads to a reduction in income inequality. The high t-statistic and low probability (p-value) confirm the strong negative impact of GDP on the Gini index. The positive coefficient of the DReal_income variable suggests that an increase in real income leads to an increase in income inequality, and the model shows that this relationship is highly significant.

The positive coefficient of DSocial_aid suggests that government social assistance increases income inequality, contrary to what might be expected. A negative coefficient on the Migration variable indicates that migration reduces income inequality, with a high level of significance indicating a strong relationship.

The coefficient of the Inflation variable is not significant, indicating that inflation does not have a statistically significant effect on income inequality in this model.

A negative coefficient on a constant suggests that other constant factors not specified in the model also negatively affect income inequality, and that the effect is significant.

The model's R-squared value of 0.82 indicates that the included predictors can explain 82% of the variability in the Gini index, which is a good fit for economic data.

The F-statistic and its associated probability value further support the overall significance of the model.

This analysis highlights the complex relationships between income inequality and various economic factors. Notably, while GDP growth and migration appear to reduce income inequality, increases in real income and, surprisingly, social assistance are associated with higher levels of inequality. The small effect of inflation suggests that its effect on income inequality may be more subtle or variable, depending on other conditions.

The positive association of social assistance with income inequality may require further investigation as it may reflect the structure of the social assistance being analyzed, the context in which it is provided, or the possibility that it is not sufficiently targeted at those who need it most.

Overall, the findings highlight the multifaceted nature of income inequality and underscore the importance of considering various economic variables when analyzing its determinants.

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Conclusions

This study provides a comprehensive analysis of the factors influencing income differentiation in the Republic of Kazakhstan and demonstrates the multidimensional relationships between income inequality and various economic indicators. The study results confirm that GDP, real income, social assistance, migration and inflation have a significant impact on the Gini index, which in turn reflects the level of income inequality in a country.

The analysis found that GDP growth and migration help reduce income inequality, while increases in real income and, unexpectedly, social assistance are associated with increases in inequality levels. The effect of inflation on income inequality was not statistically significant, indicating that its effects may be ambiguous depending on other conditions. Particular attention should be paid to the positive association of social assistance with income inequality, which may require additional analysis to understand the structure of social assistance provided, the context of its provision and the targeting of those most in need.

The findings highlight the need to develop multilevel strategies and policies to reduce income inequality. This includes not only economic measures such as tax policies and support for entrepreneurship but also social investments in education, health, and infrastructure, as well as improved labor market regulation and access to financial services.

In conclusion, the study of income inequality in Kazakhstan reveals its complex nature and requires a comprehensive approach to addressing this problem. Effectively managing income inequality is critical to achieving more equitable, inclusive and sustainable economic development.

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The contribution of the authors
Temerbulatova Zhansaya – conceptual foundations of the study, formulation of hypotheses, choice of methodology, econometric data analysis and preparation of the main text of the article.
Kondybayeva Saltanat – processing of empirical data, interpretation of research results, discussion of results, preparation of tables and figure.
Sagynbayeva Aitolkyn – literature review, data collection, preparation of the article according to the requirements of the journal.

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Дифференциация доходов в Казахстане: углубленное изучение ее экономических и социальных факторов

Аннотация. Данное исследование комплексно выявляет и количественно оценивает факторы, влияющие на дифференциацию доходов в Казахстане, демонстрируя многогранные связи между неравенством доходов и различными экономическими показателями. Используя методологию количественного исследования, в исследовании используется авторегрессионная модель с распределенным лагом для анализа влияния ВВП, реальных доходов, социальной помощи, миграции и инфляции на индекс Джини в Казахстане с 2001 по 2022 год. Данные были получены из Бюро национальной статистики, обеспечивающее прочную и надежную основу для анализа. Исследование подчеркивает актуальность решения проблемы неравенства доходов для достижения экономического роста, сбалансированного с социальной справедливостью, подчеркивая глобальную приверженность целям устойчивого развития. Результаты показывают, что рост ВВП и миграция способствуют сокращению неравенства доходов, тогда как рост реальных доходов и, что неожиданно, социальной помощи связаны с более высоким уровнем неравенства. Влияние инфляции на неравенство доходов было статистически незначимым, что позволяет предположить, что ее влияние может быть неоднозначным в зависимости от других условий. В целом, полученные результаты свидетельствуют о необходимости разработки многоуровневых стратегий и политики, направленных на сокращение неравенства доходов, включая экономические меры, социальные инвестиции и улучшение регулирования рынка труда для достижения более справедливого, инклюзивного и устойчивого экономического развития в Казахстане.

Ключевые слова: неравенство доходов, экономический рост, авторегрессионная модель с распределенным лагом, социальная помощь, индекс Джини.

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Қазақстандағы табыстардың дифференциациясы: экономикалық және әлеуметтік факторларын терең зерттеу

Аңдатпа. Бұл зерттеу Қазақстандағы табыс теңсіздігіне әсер ететін факторларды жан-жақты және сандық түрде анықтайды, табыс теңсіздігі мен әртүрлі экономикалық көрсеткіштер арасындағы көп қырлы байланыстарды көрсетеді. Зерттеудің сандық әдістемесін пайдалана отырып, зерттеуде 2001-2022 жылдар аралығындағы Қазақстандағы Джини индексіне ЖІӨ, нақты кіріс, әлеуметтік көмек, көші-қон және инфляцияның әсерін талдау үшін авторегрессиялық үлестірілген лаг моделі пайдаланылады. Мәліметтер Ұлттық статистика бюросынан алынды, бұл талдау үшін берік және сенімді негіз болып табылады. Зерттеу әлеуметтік әділеттілікпен

теңгерілген экономикалық өсуге қол жеткізу үшін табыс теңсіздігін шешудің өзектілігін, тұрақты даму мақсаттарына жаһандық міндеттемені көрсетеді. Нәтижелер ЖІӨ өсуі мен көші-қон табыс теңсіздігін төмендетуге ықпал ететінін көрсетеді, ал нақты табыстың өсуі және таң қаларлықтай әлеуметтік көмек теңсіздіктің жоғары деңгейімен байланысты. Инфляцияның табыс теңсіздігіне әсері статистикалық тұрғыдан маңызды болмады, бұл оның әсері басқа жағдайларға байланысты аралас болуы мүмкін екенін көрсетеді. Тұтастай алғанда, қорытындылар Қазақстандағы неғұрлым әділ, инклюзивті және тұрақты экономикалық дамуға қол жеткізу үшін экономикалық шараларды, әлеуметтік инвестицияларды және еңбек нарығын реттеуді жақсартуды қоса алғанда, табыс теңсіздігін төмендетуге бағытталған көп деңгейлі стратегиялар мен саясаттарды әзірлеу қажеттілігін көрсетеді.

Түйін сөздер: табыс теңсіздігі, экономикалық өсу, авторегрессиялық үлестірілген лаг моделі, әлеуметтік көмек, Джини индексі.

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