

**ECONOMICS***Sociology*

Temerbulatova, Zh., Mukhamediyev, B., Zhidebekkyzy, A., & Bilan, S. (2024). Regional disparities and dual dynamics: Economic growth and income inequality in Kazakhstan. *Economics and Sociology*, 17(2), 241-255. doi:10.14254/2071-789X.2024/17-2/12

**REGIONAL DISPARITIES AND  
DUAL DYNAMICS: ECONOMIC  
GROWTH AND INCOME  
INEQUALITY IN KAZAKHSTAN****Zhansaya Temerbulatova**

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**ABSTRACT.** This study examines the complex relationships between economic growth and income inequality in different regions of Kazakhstan, revealing the nuances of their interaction. The article aims to assess the long-term and short-term effects of economic growth on income inequality in both forward and reverse directions across the regions of Kazakhstan. Employing region-specific time series data allowed us to examine the bidirectional impact of economic growth on inequality, using an error correction model (ECM) to describe short-run and long-run relationships. The results highlight that the relationship between economic growth and income inequality is heterogeneous across regions, reflecting each area's unique economic and social landscapes. The estimation results support the hypothesis of an inverted U-shaped Kuznets curve linking GRP per capita to inequality with varying starting points for different regions. Regarding the inverse relationship, we identified a positive causal relationship for the West Kazakhstan, Zhambyl and Pavlodar regions, indicating that increased income inequality stimulated economic growth. The study also highlights the significant role of trade, labour force, investment and government consumption in shaping these relationships.

*Received:* June, 2023

*1st Revision:* April, 2024

*Accepted:* May, 2024

DOI: 10.14254/2071-  
789X.2024/17-2/12

**JEL Classification:** C32, D63,  
R11, O47

**Keywords:** income inequality, economic growth, time series analysis, region-specific model, Kuznets curve, regional analysis.

## Introduction

The study of the relationship between economic growth and income inequality remains a significant topic in economic theory and practice. This connection can manifest itself both in the forward and reverse direction, making the topic complex and multifaceted. Research shows that economic growth can both stimulate an increase in inequality through the mechanisms of capital investment and technological change and reduce it through improving living standards and access to education. The first study of the relationship between economic growth and income inequality was done by Kuznets (1955). Kuznets suggested that during the process of economic development, income inequality first increases and then begins to decrease, forming a curve resembling an inverted letter U. This assumption is based on historical data on population income during industrialisation. However, Kuznets' theory has been criticised for assuming an automatic transition to reducing inequality. Critics point out that without strong social and economic policies to reduce inequality, such a transition may not occur. Moreover, current data shows that inequality continues to rise in some countries, even with high levels of economic development.

In Kazakhstan, despite overall economic growth, there are significant differences in income between different segments of the population and regions of Kazakhstan. Kazakhstan has substantial natural resources, but their distribution and exploitation are uneven across the country. For example, regions, such as West Kazakhstan and Pavlodar, are rich in oil, gas and minerals, providing a high per capita income. However, such areas as Kyzylorda and Zhambyl experience significantly greater economic backwardness and high poverty levels. Understanding the causes of these differences and their impact on public well-being and social stability is crucial in developing effective social and economic policies.

Thus, this article aims to assess the long-term and short-term effects of economic growth on income inequality in the forward and reverse directions in regions of Kazakhstan.

The rest of the paper is organised as follows. The Literature Review section provides an overview of the relevant literature on the impact of economic growth on inequality and the impact of inequality on economic growth. The Methodology section discusses the analytical concept and data used. Section Results and Discussion presents dynamic cause-and-effect analysis, empirical modelling, and discussion of the results obtained. The last section presents the study's findings for Kazakhstan's regions and directions for future research.

## 1. Literature review

In recent decades, the scientific community has intensified its study of the relationship between economic growth and income inequality, looking at both the direct and reverse effects of these phenomena. Empirical and theoretical work in this area aims to identify the mechanisms through which economic growth can lead to changes in income distribution and assess how existing levels of inequality can influence subsequent rates of economic development. It should be noted that all authors emphasise that the relationship between economic growth and income inequality is complex and context-dependent. For example, Rubin & Segal (2015), examining the relationship between economic growth and income inequality in the United States from 1953 to 2008, find that the incomes of high-income groups are more sensitive to growth than lower-income groups' incomes. Other authors using panel data analysis have found a positive effect of economic growth on income inequality, with more significant effects observed in lower- and upper-middle-income countries (Alamanda, 2021; Lojanica & Tubic, 2019; Mudričenko, et al., 2023; Tung & Bentzen, 2022; Zhidebekkyzy, 2019; Ziang, 2024). An analysis of the impact of income inequality on GDP per capita growth,

using the Gini coefficient and considering other factors, showed that income inequality is an important factor in economic growth, while the savings rate and fertility rate also play an important role. The unemployment rate was considered completely insignificant (Hunter et al., 2016; Zhidebekkyzy et al., 2020).

In contrast, Mo (2000) found that income inequality significantly negatively impacts the GDP growth rate, with a substantial direct effect on productivity growth. Studies by Abdullahi & Muse (2015) and Assia & Fayecal (2019) later confirmed this finding. The former used data from 90 developed and developing countries to identify a negative relationship, and the latter suggested that high levels of inequality can hamper economic growth by limiting access to education and healthcare.

Shen (2015) analysed the impact of income inequality on economic growth through the supply of human capital and the incentives for invention generated by the demand for higher-quality goods. The study noted that using the Gini coefficient alone cannot provide an overall link between income inequality and economic growth. The technique involves decomposing the Gini coefficient into two variables with different effects on economic indicators (Sabden et al., 2020; Kalmakova et al., 2021). A study by Alsaffar et al. (2018) found no significant evidence to support a negative relationship between income inequality and economic growth. Income inequality may have a greater impact on economic growth in the long run, while variables such as savings, unemployment and investment are more likely to affect economic growth in the short run.

Authors from different countries have also examined differences in the impact of income inequality on economic growth across countries and regions (Bahmani-Oskooee & Ardakani, 2020; Brueckner & Lederman, 2018; Makdissi & Wodon, 2012). Sbaouelgi & Boulila (2016) found that the impact of inequality on economic growth varies across GCC countries. Income distribution plays an important role in economic growth, especially in Arab Spring countries seeking to achieve higher growth rates by reducing income inequality. Yang & Greaney (2017) analysed the long- and short-term relationships between inequality and economic growth, controlling for other macroeconomic indicators for four economies: China, Japan, South Korea, and the United States. Trade openness reduced inequality in the United States and Japan, worsened it in China, and had no significant impact in South Korea. In terms of inequality and GDP per capita, exports have boosted Japan's economic growth. Regarding redistribution, although financial redistribution measures reduced inequality in Japan, they did not play a significant role in the other three countries. For developing countries income redistribution based on government assistance programs for vulnerable population groups can have significant positive influence on labour market and economic growth via the multiplier effect (Yurchyk et al., 2023). Biswas et al. (2017), using US state-level data over the past three decades, concluded that reducing income inequality between low- and middle-income households improves economic growth while reducing income inequality through taxation between middle- and high-income households reduces economic growth. Remeikiene & Gaspareniene (2021) and Mishchuk et al. (2018) found that income inequality linked with high share of untransparent relations leads to decrease in economic growth and positive social changes. The similar influence has public trust and public sector transparency (Aliyev et al., 2022; Vasylieva et al., 2023). Thus, we can conclude that the impact of income inequality on economic growth can vary significantly not only across countries but also across regions within a country.

The literature review explored various aspects of the relationship between economic growth and income inequality. Research demonstrates the complexity of this relationship, which varies depending on regional and temporal contexts, methodologies, and data used. An important conclusion is that economic growth can both stimulate increased inequality and be a

consequence of it. It was also found that income inequality can both negatively and positively affect economic growth, depending on other macroeconomic factors.

However, there are research gaps related to the simultaneous assessment of the bidirectional relationship between income inequality and economic growth. Existing research often focuses on either analysing the impact of inequality on economic growth or assessing the consequences of economic growth on income inequality. However, few studies investigate these interaction processes in an integrated manner. Additionally, most existing studies focus on specific countries, which limits the ability to examine differences in the relationship between inequality and economic growth within countries or groups of countries. This highlights the need for cross-country and cross-regional comparative research to develop more universal approaches to managing inequality and stimulating economic growth.

## 2. Methodological approach

Given the limitations of ignoring unique regional characteristics when using a cross-sectional analysis method, this study chose to use a time series analysis methodology for each region instead of analysing panel data. This approach allows us to consider the region's heterogeneity, thereby providing a more accurate and detailed understanding of the economic processes in each region. The importance of this methodological decision is due to the desire to reflect the specific economic and social conditions that can influence economic growth and income inequality in each region. This method allows for regional heterogeneity when analysing the relationship between economic growth and inequality (Yang & Greaney, 2017). Therefore, we use an error correction model (ECM) to study the dynamic relationship between economic growth and income inequality. Following Engle and Granger's two-step approach, we first test for the existence of a cointegration relationship between economic growth and inequality. In addition, we take other factors into account. Using extended Dickey-Fuller statistics, each time series variable is examined in isolation for its non-stationarity. Then, after estimating the cointegration regression, the regression residuals were obtained and tested for stationarity, i.e. integration of order  $I(0)$ . If the residual term is stationary, then the time series variables are cointegrated, and a long-run relationship between the variables can be established.

The relationship between economic growth and income inequality is examined in a bidirectional manner. First, a cointegrative regression of the GRP per capita coefficient on the Gini coefficient is estimated, followed by the Gini coefficient on GRP per capita. The general equations of the models are as follows:

$$gini_t = \alpha_0 + \alpha_1 lgrppc_t + \alpha_2 (lgrppc_t)^2 + \alpha_3 (lgrppc_t)^3 + \sum_{i=1}^n \varphi_i X_{i,t} + \varepsilon_t \quad (1)$$

$$lgrppc_t = \beta_0 + \beta_1 gini_t + \sum_{i=1}^n \mu_i Z_{i,t} + u_t \quad (2)$$

where  $gini_t$  is the measurement of income inequality,  $lgrppc_t$  is the real per capita gross regional product, expressed in natural logarithm form,  $(lgrppc_t)^2$  and  $(lgrppc_t)^3$  are its square and cubic forms, respectively,  $X_{i,t}$  and  $Z_{i,t}$  indicate all other explanatory variables, and  $\varepsilon_t$ ,  $u_t$  are regression residuals.

All variables used for analysis, as well as their description and rationale, are listed in Table 1.

Table 1. Definitions of variables

Variable	Definition	Rationale
gini	Gini coefficient, for 10% of population groups	The Gini coefficient is a standard indicator for measuring income inequality.
lrgppc	Logarithm of real gross regional product	Standard indicator for measuring the size of a region's economy.
tradesh	Export plus import (% of GRP)	The share of trade can influence economic growth and inequality because integration into the world economy can change the structure of employment and income.
ginidev	deviations of the region's Gini coefficient from the national average	This indicator allows to assess whether a region is more or less equal by income compared to other regions
labfosh	Labor force (% of total population)	High employment can promote economic growth by distributing income and improving living standards.
exportsh	Exports of goods and services (% of GRP)	Exports can contribute to GRP growth and changes in the income structure
govconsh	Government final consumption expenditure (% of GRP)	Government spending can reduce inequality through redistribution and the provision of public goods, which helps stabilise the economy and support growth
investsh	Investments in fixed capital (% of GRP)	Investment affects economic growth, which can change income distribution and influence inequality, depending on who benefits from new economic opportunities.
prim	Primary education coverage (%)	Education helps reduce inequality by providing equal opportunities to the population.
fert	Fertility rate, total (births per woman)	Fertility affects demographic structure and potential economic growth by changing the size and composition of the labour force

Source: *own compilation*

Data on all variables by region were collected from the Bureau of National Statistics of Strategic Planning and Reform Agency of the Republic of Kazakhstan for the period from 2001 to 2022.

We investigate the effects of trade and Gini index deviation in the growth-inequality relationship. As for the inequality-growth relationship, based on both macroeconomic theory and the endogenous growth model, we put emphasis on factors such as export, investment, government expenditures, the share of the labour force, coverage by primary education and fertility rate.

To compare the relationship between growth and inequality across Kazakhstan's regions, we first build a baseline model that includes common determinants and covers data from similar time periods. This way, we can examine and differentiate the impact on economic growth or inequality within the same model forecast for each region. Next, we selectively apply different variables for different regions in the region-specific model when estimating the cointegration regression. Thus, we consider the heterogeneity of regions by including only those determinants in equations (1) and (2) that give statistically significant coefficients for each region.

After estimating equations (1) and (2), if  $\varepsilon_t$  and  $u_t$  are stationary, then all-time series variables are cointegrated, and the estimated coefficients of each variable reflect their long-run effects.

According to the two-stage Engle–Granger error correction model, equations (1) and (2) reflect the long-run relationship between economic growth, income inequality, and their determinants. In the second stage, we try to capture the short-run impact of each variable on

inequality and output levels, respectively. By regressing changes in the Gini index on lagged changes in its determinants as well as the equilibrium residual represented by  $\varepsilon_{t-1}$ , we can obtain the short-run impact of the explanatory variables in the previous period on the Gini index in the current period. In addition, we can also determine the rate at which the Gini index adjusts to the equilibrium state after a shock, which is called the error correction rate. A similar equation is used to determine the short-run impact of each variable on GRP per capita. The corresponding error correction models for equations (1) and (2) are shown as follows:

$$\Delta gini_t = \theta_0 + \theta_1(\Delta lrgprppc_{t-1}) + \theta_2\Delta(lrgprppc_{t-1})^2 + \theta_3\Delta(lrgprppc_{t-1})^3 + \sum_{i=1}^n \delta_i \Delta X_{i,t-1} + \theta_4 \varepsilon_{t-1} + v_t \quad (3)$$

$$\Delta lrgprppc_t = \gamma_0 + \gamma_1 \Delta gini_{t-1} + \sum_{i=1}^n \lambda_i \Delta Z_{i,t-1} + \gamma_2 u_{t-1} + \pi_t \quad (4)$$

where  $\Delta$  indicates changes in variables,  $v_t$  and  $\pi_t$  are residuals. Among the coefficients,  $\theta_4$  and  $\gamma_2$  represent the speed adjustment coefficients. Additionally, the Durbin-Watson test is used to test the existence of a serial correlation problem. In the study, we use this time series analysis for each region to understand better how regional economies experience different dynamics between growth and income inequality in their unique development context. Moreover, by including long-run and short-run effects in the model, we formulate the relationship between output levels and inequality in equilibrium, as well as the relationship between growth and inequality in a dynamic sense. The least squares method (OLS) was applied to all equations. All calculations were performed in the Eviews package.

The following four regions of Kazakhstan were selected for analysis: West Kazakhstan region, Kyzylorda region, Zhambyl region, and Pavlodar region. First, the selected regions have more complete and accurate data on inequality, economic growth and other socio-economic indicators. Secondly, the selected regions are located in different parts of the country. Geographic diversity allows us to assess how regional location influences economic outcomes and levels of inequality. Third, selecting these regions ensures a good representation of the different types of economic and social conditions in Kazakhstan. Its wealth of natural resources and high level of industrial activity make West Kazakhstan well-suited for studying how natural resources influence income and inequality. The predominance of agriculture in the Kyzylorda and Zhambyl regions provides an opportunity to study the impact of the agricultural sector on the standard of living and income distribution among the population. The inclusion of Pavlodar region in the study is justified by its significant industrial activity and strategic geographic position in northeast Kazakhstan, making it ideal for examining the impacts of industrialization and geographic location on economic outcomes and inequality. Pavlodar's diverse mix of heavy industry and proximity to major trade routes offers unique insights into regional disparities and the socio-economic dynamics within Kazakhstan. Thus, these regions represent a wide range of economic activities and socio-economic conditions, making them suitable for a comprehensive analysis of the relationships between economic growth and income inequality in Kazakhstan.

### 3. Conducting research and results

To compare the results obtained from the baseline model of the impact of economic growth on income inequality in 4 regions of Kazakhstan, estimates of regression coefficients are summarised in Table 2.

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Table 2. The effect of economic growth on inequality: baseline model

Dependent variable:	West Kazakhstan region	Kyzylorda region	Zhambyl region	Pavlodar region
gini				
lgrppc	24.905** (9.660)	2.453 (6.602)	10.67 (27.245)	-14.654 (27.913)
lgrppc <sup>2</sup>	-3.202** (1.263)	-0.342 (0.937)	-1.685 (4.201)	1.88 (3.709)
lgrppc <sup>3</sup>	0.137** (0.055)	0.016 (0.044)	0.089 (0.216)	-0.08 (0.164)
tradesh	0.00029** (0.00013)	0.0005** (0.0002)	0.002*** (0.0005)	0.0006 (0.0005)
constant	-64.253** (24.59)	-5.601 (15.457)	-22.28 (58.848)	38.297 (69.953)
N	22	22	22	22
R <sup>2</sup>	0.588	0.387	0.425	0.238
SKtest	0.711	0.103	0.156	0.084
rmse	0.017	0.022	0.015	0.024
Res. ADF test	I(0)	I(0)	I(0)	I(0)
Dependent variable:	West Kazakhstan region	Kyzylorda region	Zhambyl region	Pavlodar region
$\Delta$ gini				
$\Delta$ lgrppc(-1)	-16.303 (8.831)	-4.728 (6.944)	-20.27 (37.726)	-23.105 (29.994)
$\Delta$ lgrppc <sup>2</sup> (-1)	2.072 (1.147)	0.654 (0.968)	3.085 (5.794)	3.052 (3.962)
$\Delta$ lgrppc <sup>3</sup> (-1)	-0.088 (0.050)	-0.030 (0.045)	-0.157 (0.296)	-0.134 (0.174)
$\Delta$ tradesh(-1)	-0.00021 (0.00012)	-0.0005** (0.0002)	-0.0007 (0.0006)	-2.24e-05 (0.0005)
ecm(-1)	-1.125*** (0.284)	-0.792** (0.274)	-0.604 (0.315)	-0.459** (0.248)
constant	0.0045 (0.0025)	-0.003 (0.004)	-0.003 (0.004)	-3.35e-05 (0.005)
N	20	20	20	20
R <sup>2</sup>	0.613	0.472	0.384	0.254
SK test	0.586	0.231	0.209	0.094
rmse	0.015	0.018	0.017	0.019
Res. ADF test	I(0)	I(0)	I(0)	I(0)
DW	1.755	1.362	1.832	1.471

Notes: 1) compiled by authors using Eviews;

2) in parentheses, there are robust standard regression coefficient errors;

3) \*\*, \*\*\* - significance of coefficients at 5% and 1% levels, respectively

Source: *own compilation*

In a long-run relationship regression, all variables are cointegrated for each region of the country. Among the common determinants, three indicators of GRP per capita are statistically significant in the cointegration equation for West Kazakhstan. The signs of the coefficients are first positive, then negative, and again positive. This indicates that the relationship between GRP per capita and income inequality is consistent with the inverted U-shaped Kuznets curve theory. A positive coefficient in this region indicates an increase in inequality with increasing economic activity. In addition, the coefficients of trade openness are statistically significant for all regions of the sample except the Pavlodar region. This means that globalisation has affected income inequality, and the relationship is positive. This indicates that

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increased trade contributes to rising inequality. This may be because trade contributes to the concentration of capital and income in the hands of a limited number of participants in economic activity.

Regarding the short-term effect estimated in the ECM regression, all coefficients of the adjustment rate are negative and statistically significant for all regions. The coefficient of the ECM variable shows that inequality tends to a certain level of equilibrium after shocks, but the rate of return to equilibrium varies across regions. Negative values of the ECM coefficients indicate that any short-term increase in inequality is adjusted towards the steady state over time, which may be associated with adaptive mechanisms of the economy, such as labour market regulation and social transfers. Variations in GRP per capita variables show that changes in economic growth have an unstable effect on inequality in the short term.

The relationship between GRP per capita and inequality is not straightforward and varies by region. Therefore, Table 3 below presents the results of the region-specific model, where different variables are selectively applied to account for the regions' characteristics.

Table 3. The effect of economic growth on inequality: region-specific model

Dependent variable:	West Kazakhstan region	Kyzylorda region	Zhambyl region	Pavlodar region
gini				
lgrppc	0.838** (0.394)	0.034*** (0.0009)	0.036*** (0.0007)	0.038*** (0.001)
lgrppc <sup>2</sup>	-0.053** (0.026)			
tradesh	0.00036** (0.00015)			
ginidev				0.758*** (0.261)
constant	-3.026** (1.504)			
N	22	22	22	22
R <sup>2</sup>	0.438	0.345	0.486	0.171
SK test	0.456	0.411	0.424	0.102
rmse	0.014	0.029	0.022	0.027
Res. ADF test	I(0)	I(0)	I(0)	I(0)
Dependent variable:	West Kazakhstan region	Kyzylorda region	Zhambyl region	Pavlodar region
Δgini				
Δlgrppc(-1)	-0.877** (0.329)		-0.052** (0.025)	-0.035*** (0.011)
Δlgrppc <sup>2</sup> (-1)	0.057** (1.147)			
Δtradesh(-1)	-0.00027** (0.00012)			
ecm(-1)	-0.999*** (0.237)	-0.384*** (0.143)		
constant	-0.004** (0.0024)			
N	20	20	20	20
R <sup>2</sup>	0.625	0.263	0.172	0.124
SK test	0.654	0.345	0.309	0.067
rmse	0.011	0.019	0.017	0.016
Res. ADF test	I(0)	I(0)	I(0)	I(0)
DW	1.867	1.941	2.012	1.866

Notes: 1) compiled by authors using Eviews;  
 2) in parentheses, there are robust standard regression coefficient errors;  
 3) \*\*, \*\*\* - significance of coefficients at 5% and 1% levels, respectively

Source: *own compilation*



Table 3 highlights the heterogeneous effects of economic activities and suggests that regional characteristics significantly influence these dynamics. In the West Kazakhstan region, economic growth, as measured by GRP per capita, has a significant impact on income inequality, which is consistent with the inverted U-shaped Kuznets curve hypothesis. The first coefficient is positive, suggesting that initial economic growth increases inequality. However, the second term is negative, indicating a reduction in inequality at higher levels of GRP per capita. Moreover, trade openness exacerbates inequality, suggesting that economic integration may disproportionately benefit higher-income groups in the region.

In the remaining analyzed areas, only one coefficient of GDP per capita showed a statistically significant relationship at the 1% level in the long term. In addition, we included a variable of the Gini coefficient's deviation for the Pavlodar region, which turned out to be positively significant at the 1% level in the long run. This suggests that regional inequality increases as the deviation from the national level of inequality increases.

It should be noted that in the short term, GRP per capita affects income inequality in the opposite direction. Because, in the short term, the economy may respond to temporary shocks or changes in economic policy that do not reflect long-term trends. The changing signs of the coefficients in the ECM model highlight the complexity and dynamism of the relationship between economic growth and inequality in different regions of Kazakhstan. Short-term changes are likely to reflect temporary and context-dependent responses to internal and external pressures, while long-term outcomes more accurately reflect stable economic trends.

Overall, the results of Table 3 indicate that economic development and policy responses in Kazakhstan should be region-specific, taking into account the unique economic structure and socio-economic dynamics of each region. The inverted Kuznets U-curve hypothesis is observed, but its applicability varies, reflecting the complex interaction between economic growth and income inequality. For example, in Western Kazakhstan and Pavlodar, where there is a significant positive correlation, there may be growth in sectors that do not provide broad benefits, such as oil, gas and heavy industry, which often generate high incomes for a small segment of the population. In Kyzylorda and Zhambyl, the benefits of economic growth may be more evenly distributed, or there may be no strong growth drivers that significantly influence the overall income distribution.

These results highlight the importance of adapting economic and social policies to regional contexts to effectively address income inequality.

Now, let's proceed to the analysis in the opposite direction, assessing the impact of income inequality on economic growth (Table 4).

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Table 4. The effect of inequality on economic growth: baseline model

Dependent variable:	West Kazakhstan region	Kyzylorda region	Zhambyl region	Pavlodar region
lgrppc				
gini	13.270*** (4.417)	-10.957** (4.433)	-4.243 (3.572)	-5.853 (3.841)
labfosh	0.168*** (0.042)	0.18*** (0.058)	0.083*** (0.012)	0.130*** (0.029)
exportsh	-0.0016 (0.0032)	0.005 (0.004)	-0.012 (0.01)	-0.0029 (0.0065)
govconsh	-0.016 (0.057)	-0.077 (0.080)	-0.029 (0.032)	-0.060 (0.055)
investsh	-0.0072** (0.0030)	0.014 (0.016)	-0.009 (0.005)	-0.0009 (0.015)
constant	-4.217 (2.337)	1.966 (2.623)	3.876*** (0.778)	0.985 (1.673)
N	22	22	22	22
R <sup>2</sup>	0.727	0.672	0.799	0.547
SK test	0.452	0.405	0.87	0.396
rmse	0.425	0.379	0.152	0.269
Res. ADF test	I(0)	I(0)	I(0)	I(0)
Dependent variable:	West Kazakhstan region	Kyzylorda region	Zhambyl region	Pavlodar region
$\Delta$ lgrppc				
$\Delta$ gini(-1)	7.462** (2.932)	0.485 (2.431)	-0.19 (2.571)	2.468 (2.473)
$\Delta$ labfosh(-1)	0.040 (0.035)	0.077** (0.031)	0.03 (0.022)	0.051** (0.024)
$\Delta$ exportsh(-1)	-5.16e-05 (0.0018)	-0.001 (0.002)	0.004 (0.007)	-0.012** (0.006)
$\Delta$ govconsh(-1)	0.049 (0.026)	-0.006 (0.035)	-0.011 (0.022)	-0.078** (0.029)
$\Delta$ investsh(-1)	-0.0071** (0.0031)	-0.006 (0.009)	-0.002 (0.004)	-0.009 (0.008)
ecm(-1)	0.301 (0.191)	-0.058 (0.146)	-0.639 (0.311)	-0.246 (0.191)
constant	-0.031 (0.040)	-0.032 (0.041)	0.014 (0.029)	-0.031 (0.034)
N	20	20	20	20
R <sup>2</sup>	0.595	0.513	0.546	0.455
SK test	0.674	0.321	0.489	0.098
rmse	0.209	0.179	0.125	0.14
Res. ADF test	I(0)	I(0)	I(0)	I(0)
DW	1.964	0.974	1.705	2.306

Notes: 1) compiled by authors using Eviews;

2) in parentheses, there are robust standard regression coefficient errors;

3) \*\*, \*\*\* - significance of coefficients at 5% and 1% levels, respectively

Source: *own compilation*

The West Kazakhstan region shows a statistically significant, at the level of 1%, and positive impact of inequality on economic growth. The positive impact may be due to the fact that high levels of inequality in this region stimulate investment activity and consumption, which in turn supports economic growth.

Pavlodar and Zhambyl regions demonstrate a lack of statistically significant influence, which may indicate different mechanisms of interaction between economic and social factors in these regions.

Kyzylorda region shows a statistically significant at the 5% level and negative impact of inequality on economic growth, which may indicate that high levels of inequality limit the region's economic development. This highlights the possible risks associated with high inequality, including limited access to education and health care, reduced consumer demand and social tensions that inhibit economic development.

The labour force variable shows a positive and statistically significant effect on GRP per capita in all four regions. The result highlights the critical role of labour in economic development and indicates that increasing employment or improving the quality of the labour force directly contributes to increased economic productivity.

It was found that government spending and export do not statistically impact economic growth in any region in the sample. This suggests that government spending in the regions of the sample may not be allocated efficiently. Finally, the investment variable gives negative and statistically significant coefficients for the West Kazakhstan and Zhambyl regions. Negative and statistically significant coefficients may indicate that investment in these regions is directed to inefficient sectors or does not lead to the expected increase in production capacity.

In the short term, we found that the lagged change in Gini has a statistically significant and positive effect on changes in GRP per capita only in the West Kazakhstan region. Also, in this region, lagged changes in government spending have a significant and positive impact on changes in GRP per capita. The growth of the labour force has a positive effect on the growth of GRP per capita in the Kyzylorda and Pavlodar regions, and the growth of exports has a negative effect in the Pavlodar region.

Thus, the results highlight that there is no universal solution to addressing inequality and its impact on economic growth, i.e. each region requires its own specific measures.

Differences in results across regions indicate the need to take into account regional differences, which are presented in Table 5.

In West Kazakhstan, Zhambyl and Pavlodar regions, the Gini coefficient shows a significant positive effect on GRP per capita, implying that higher income inequality is associated with higher economic output, possibly due to the concentration of wealth and capital. The labour force has a positive effect on GRP per capita in the three regions, indicating that an increase in the labour force has a positive effect on economic productivity. Investment has a negative impact on GRP per capita in West Kazakhstan region, suggesting that current investment may not effectively contribute to economic growth, possibly due to misallocation or unproductive investment.

In the short term, changes in exports and government spending also showed a statistically significant positive impact on economic growth in the Pavlodar region, and in the Kyzylorda region the birth rate also turned out to be significant. These variables can play a key role in stimulating economic growth in the short term by boosting manufacturing activity and domestic demand.

Overall, these results suggest that economic growth strategies in Kazakhstan need to be detailed and regionally tailored to effectively address the specific economic and social conditions of each region.

## RECENT ISSUES IN ECONOMIC DEVELOPMENT

Table 5. The effect of inequality on economic growth: region-specific model

Dependent variable:	West Kazakhstan region	Kyzylorda region	Zhambyl region	Pavlodar region
lrgppc				
gini	15.369*** (5.814)		5.171** (2.458)	17.358*** (3.557)
labfosh		0.158*** (0.0019)	0.104*** (0.011)	0.198*** (0.023)
investsh	-0.0082** (0.0034)			
ginidev				-18.901*** (4.621)
constant	3.848** (1.496)			-8.632*** (1.699)
N	22	22	22	22
R <sup>2</sup>	0.305	0.493	0.179	0.882
SK test	0.0998	0.236	0.134	0.568
rmse	0.373	0.411	0.275	0.149
Res. ADF test	I(0)	I(0)	I(0)	I(0)
Dependent variable:	West Kazakhstan region	Kyzylorda region	Zhambyl region	Pavlodar region
$\Delta$ lrgppc				
$\Delta$ gini(-1)	5.588** (2.459)			4.193** (1.914)
$\Delta$ labfosh(-1)		0.096*** (0.013)		0.117** (0.056)
$\Delta$ exportsh(-1)				0.013** (0.006)
$\Delta$ govconsh(-1)				0.073*** (0.024)
$\Delta$ investsh(-1)	-0.0087*** (0.0027)			
$\Delta$ fert(-1)		0.057** (0.027)		
ecm(-1)			-0.38*** (0.088)	
constant	-0.038** (0.038)			
N	20	20	20	20
R <sup>2</sup>	0.420	0.578	0.480	0.447
SK test	0.509	0.678	0.782	0.132
rmse	0.164	0.141	0.108	0.141
Res. ADF test	I(0)	I(0)	I(0)	I(0)
DW	1.988	1.513	1.979	2.025

Notes: 1) compiled by authors using Eviews;

2) in parentheses, there are robust standard regression coefficient errors;

3) \*\*, \*\*\* - significance of coefficients at 5% and 1% levels, respectively

Source: *own compilation*

The results generally support the inverted Kuznets U-curve hypothesis, indicating that inequality tends to increase in the early stages of economic growth and decrease after a certain level of economic maturity is reached. The analysis highlights the importance of regional policies as economic growth, trade openness and investment impact vary significantly across regions.

## Conclusion

The article is an in-depth study of the bidirectional relationship between economic growth and income inequality in the regions of Kazakhstan. This two-pronged approach to analysis allows us to better understand the dynamics of socio-economic processes and develop more effective policies to achieve sustainable economic growth and reduce inequality. To take into account the characteristics of each region, the method of analysing time series of each region was used instead of analysing panel data. Also, to account for cross-regional heterogeneity, we first build a baseline model with common determinants and then regressions for each region with different combinations of variables. The analysis showed that the dynamics of the relationship between economic growth and income inequality vary across regions, highlighting the need to take local characteristics into account when formulating economic policies. For all regions studied, the theory of the inverted U-shaped Kuznets curve was true, according to which inequality can stimulate growth and then begin to slow it down. However, during the study period, regions varied in their positions along the curve. Given the differences in the impact of economic growth on inequality, policies and measures to manage inequality must be tailored to the specificities of each region. This could include stimulating the development of local industries, supporting small and medium-sized businesses, and strengthening social programs to protect vulnerable populations.

The results also showed that short-term and long-term effects may differ significantly, so it is important to conduct research on socio-economic indicators for both the short and long term. In particular, our estimation results show that the long-run relationship between inequality and income tends to be statistically significant more often than their short-term dynamic relationship. Overall, the short-run dynamic relationships between economic growth and changes in inequality in either direction are largely statistically insignificant.

A direction for future research could be comparative studies with other countries to identify the universal and unique influences of inequality on economic growth.

## Acknowledgement

This research was funded by the Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan (Grant No. AP13268961).

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