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MINING SECTOR GROWTH AND MANUFACTURING INDUSTRY GROWTH IN UZBEKISTAN: EVIDENCE FROM A SHORT-RUN OLS ANALYSIS

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Abstract: This study examines the relationship between mining sector growth and manufacturing industry growth in Uzbekistan during 2010–2025 using annual time-series data. The empirical analysis was conducted using a log-differenced Ordinary Least Squares (OLS) model with robust standard errors. The results revealed a positive and statistically significant relationship between the variables. In particular, a 1% increase in mining sector growth was associated with approximately 0.36% growth in manufacturing industry output in the short run. The findings suggest that mining sector dynamics are positively associated with manufacturing development in Uzbekistan. However, due to the limited number of annual observations, the empirical results should be interpreted with caution.

Keywords: manufacturing industry, mining sector, OLS regression, economic growth, Uzbekistan, time-series analysis.

1. Introduction

Manufacturing industry development plays an important role in economic diversification and industrial modernization in Uzbekistan. At the same time, the mining sector remains one of the major components of the national economy due to its contribution to industrial production and exports.

Given the close relationship between extractive industries and industrial production, examining the relationship between mining sector growth and manufacturing industry growth is important for understanding industrial sector dynamics in Uzbekistan. However, limited empirical research has examined their short-run relationship using recent macroeconomic data.

Therefore, this study investigates the relationship between mining sector growth and manufacturing industry growth in Uzbekistan during 2010–2025 using annual time-series data. The empirical analysis is conducted using a log-differenced Ordinary Least Squares (OLS) model to examine the short-run association between the variables.

2. Literature Review

The relationship between extractive industries and industrial development has long attracted attention in development economics literature. Hirschman (1958) emphasized the importance of backward and forward production linkages, arguing that resource-based industries may stimulate broader industrial development through intersectoral connections and demand for intermediate goods.

At the same time, the resource curse and Dutch disease theories suggest that excessive dependence on extractive industries may weaken manufacturing competitiveness and limit economic diversification. Corden and Neary (1982) argued that resource booms may negatively affect manufacturing sectors through resource reallocation and exchange rate pressures. However, later empirical and theoretical studies, particularly after the 1990s, indicate that the effects of resource sectors on industrial development are often context-dependent and influenced by economic structure, institutional quality, and industrial policy.

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In addition, Kaldor (1966) emphasized the importance of manufacturing industry development as a driver of productivity growth, technological progress, and structural transformation. From this perspective, examining factors that influence manufacturing sector growth, including the role of upstream sectors such as mining, is important for understanding industrial development processes in developing economies.

In Uzbekistan, both the mining and manufacturing sectors have played increasingly important roles in industrial development and economic modernization since the 2010s. However, limited empirical research has examined the short-run relationship between mining sector growth and manufacturing industry growth using recent macroeconomic time-series data. Therefore, this study contributes to the existing literature by providing short-run empirical evidence on mining–manufacturing sector relationships in Uzbekistan during 2010–2025 using a log-differenced OLS framework.

3. Methodology

This study uses annual time-series data for Uzbekistan covering the period 2010–2025. The data were obtained from the National Statistics Committee of the Republic of Uzbekistan and are measured at constant prices in billion soums based on the SNA 2008 methodology. The study examines the short-run relationship between manufacturing industry growth and mining sector growth.

Since the variables demonstrated strong upward trends over the study period, logarithmic transformations and first differences were applied to obtain growth-rate series and reduce the risk of spurious regression in the time-series analysis. Time-series plots were additionally examined to visually assess trend behavior and the effects of variable transformation.

Table 1. Variables Used in the Study

Variable	Description	Transformation
Y	Manufacturing industry	lnY, dlnY
X	Mining and quarrying	lnX, dlnX

The following log-differenced regression model was estimated:

$$\Delta lnY_t = \beta_0 + \beta_1 \Delta lnX_t + \varepsilon_t$$

where Δ denotes the first-difference operator, ln represents the natural logarithm, and ε_t is the error term. The estimated coefficient represents the short-run growth elasticity of manufacturing industry with respect to mining sector growth.

The econometric analysis was conducted in several stages. First, Augmented Dickey–Fuller (ADF) unit root tests were applied to examine the stationarity properties of the variables. To reduce the risk of spurious regression caused by trending behavior in the variables, first differences of logarithmic variables were calculated. After the transformation process, the Ordinary Least Squares (OLS) estimation method was applied to the differenced variables using robust standard errors. Several diagnostic tests were additionally conducted to evaluate the adequacy and reliability of the estimated model. Variance Inflation Factor (VIF) analysis was used to test multicollinearity, while the Breusch–Godfrey LM test and Breusch–Pagan test were applied to examine autocorrelation and heteroskedasticity, respectively. The diagnostic test results did not indicate serious multicollinearity, autocorrelation, or heteroskedasticity problems in the final estimated model.

4. Results

4.1 Descriptive Statistics

This section presents the descriptive characteristics and preliminary relationships of the variables used in the empirical analysis. Figure 1 illustrates the dynamics and growth rates of manufacturing industry and mining sector indicators in Uzbekistan during 2010–2025. The level variables demonstrate strong upward trends throughout the study period, indicating substantial expansion in both sectors. At the same time, the logarithmically differenced series exhibit more

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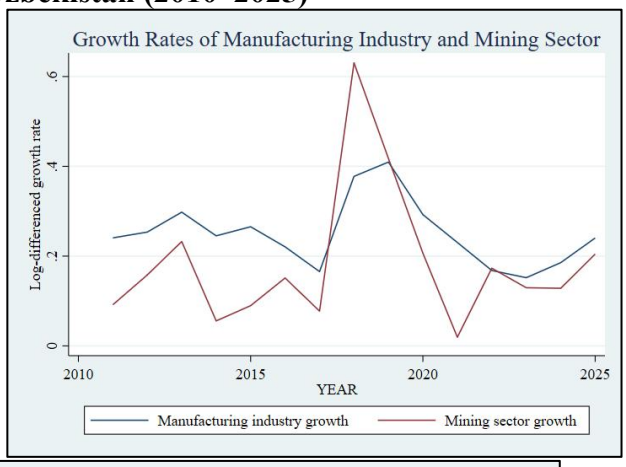
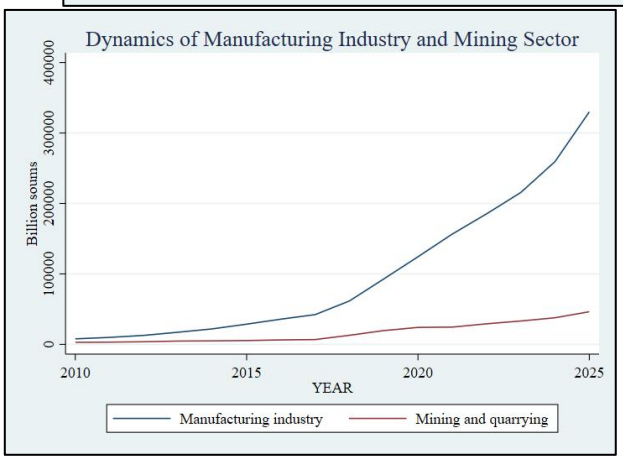
stable fluctuations over time, supporting the transformation procedure applied in the econometric analysis.

Figure 1. Dynamics and Growth Rates of Manufacturing Industry and Mining Sector in Uzbekistan (2010–2025)





(a) Dynamics of Manufacturing Industry and Mining Sector;
(b) Growth Rates of Manufacturing Industry and Mining Sector
Source: Author's calculations based on data from the National Statistics Committee of the Republic of Uzbekistan.

The descriptive statistics of the variables are presented in Table 2. The average value of manufacturing industry output during the analyzed period amounted to 100126.5 billion soums, while the mining sector averaged 16618.24 billion soums. The mean values of the differenced logarithmic variables indicate positive average annual growth in both sectors. In addition, the standard deviation values suggest moderate variability in sectoral growth rates over the study period.

Table 2. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Y	16	100126.5	101298.8	7804	329959.5
X	16	16618.24	14238.44	2916.7	46345.1
dlnY	15	0.2496	0.0733	0.1519	0.4095
dlnX	15	0.1844	0.1553	0.0194	0.6306

The correlation analysis additionally indicates a positive and statistically significant relationship between manufacturing industry growth and mining sector growth. The correlation coefficient between the differenced logarithmic variables equals 0.755 with a p-value of 0.0011,

suggesting a relatively strong positive association between the two sectors during the analyzed period.

4.2 Stationarity Results

Before estimating the regression model, the stationarity properties of the variables were examined using the Augmented Dickey–Fuller (ADF) unit root test with a deterministic trend. The results indicated that the logarithmic level variables were non-stationary, as the null hypothesis of a unit root could not be rejected at conventional significance levels. In particular, the ADF statistic for lnY equaled -0.965 with a p-value of 0.9486, while the ADF statistic for lnX equaled -1.827 with a p-value of 0.6914. The transformed series were then used in the short-run regression analysis.

Table 3. Augmented Dickey–Fuller Unit Root Test Results

Variable	Test specification	ADF statistic	p-value
***ln*Y**	With trend	-0.965	0.9486
***ln*X**	With trend	-1.827	0.6914

4.3 Regression Results

The regression results of the log-differenced model are presented in Table 4. The estimation results indicate a positive and statistically significant relationship between mining sector growth and manufacturing industry growth in Uzbekistan during the analyzed period.

Table 4. OLS Regression Results

Variable	Coefficient	Robust Std. Error	t-statistic	p-value
dlnX	0.3563	0.0819	4.35	0.001
Constant	0.1839	0.0191	9.65	0.000

Model Statistics	Value
R^2	0.5700
F-statistic	18.91
Prob > F	0.0008
Observations	15

The estimated coefficient of dlnX equals 0.3563, indicating that a 1% increase in mining sector growth is associated with approximately 0.36% growth in manufacturing industry output in the short run. The coefficient is statistically significant at the 1% significance level, suggesting that mining sector dynamics play an important role in explaining manufacturing growth in Uzbekistan.

The coefficient of determination (R^2) indicates that approximately 57.0% of the variation in manufacturing industry growth is explained by the model. In addition, the overall regression model is statistically significant according to the F-statistic probability value.

4.4 Diagnostic Tests

Several diagnostic tests were conducted to evaluate the adequacy and reliability of the estimated regression model. The Variance Inflation Factor (VIF) value equaled 1.00, indicating the absence of multicollinearity problems in the model.

The Breusch–Godfrey LM test was applied to examine autocorrelation in the residuals. The obtained probability value of 0.0699 indicates that significant autocorrelation was not detected at the 5% significance level. In addition, the Breusch–Pagan test results did not indicate the presence of heteroskedasticity, as the probability value equaled 0.8366.

Table 5. Diagnostic Test Results

Test	Statistic	p-value	Conclusion
VIF	1.00	—	No multicollinearity
Breusch–Godfrey LM test	3.285	0.0699	No significant autocorrelation
Breusch–Pagan test	0.04	0.8366	No heteroskedasticity

Overall, the diagnostic test results suggest that the estimated regression model is econometrically acceptable for short-run empirical analysis.

5. Discussion

The empirical findings indicate a positive and statistically significant relationship between mining sector growth and manufacturing industry growth in Uzbekistan. The estimated coefficient suggests that a 1% increase in mining sector growth is associated with approximately 0.36% growth in manufacturing industry output in the short run. In addition, the model explains approximately 57.0% of the variation in manufacturing industry growth.

The findings suggest that mining sector dynamics are positively associated with manufacturing sector development in Uzbekistan. However, the remaining unexplained variation indicates that manufacturing growth is also influenced by additional economic factors not included in the model. Therefore, the estimated relationship should be interpreted as short-run empirical evidence rather than a complete explanation of manufacturing industry dynamics.

Due to the limited number of annual observations, the findings should be interpreted with caution. Future research may incorporate additional explanatory variables and alternative econometric approaches for broader industrial sector analysis.

6. Conclusion

The empirical findings of the study indicate that mining sector growth is positively associated with manufacturing industry growth in Uzbekistan. The estimated results suggest that expansion in mining activity contributes to short-run manufacturing sector development, reflecting the importance of intersectoral industrial linkages within the Uzbek economy. Overall, the study provides empirical evidence supporting the role of the mining sector in industrial growth processes. However, due to the limited number of annual observations and explanatory variables, the findings should be interpreted with caution. Future research may incorporate additional economic indicators and alternative econometric approaches to provide a broader analysis of industrial sector relationships in Uzbekistan.

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