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FACTORS OF ECONOMIC GROWTH IN UZBEKISTAN. ANALYSIS AND DEVELOPMENT PROSPECTS.

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Introduction.

Economic growth is a key indicator that reflects a country's overall economic activity and the increase in the volume of production and services. It plays a crucial role in enhancing national wealth, improving living standards, creating new jobs, and ensuring overall economic well-being. Every state develops various policies and strategies to achieve sustainable economic growth. However, such growth depends not only on government policies but also on numerous internal and external factors, including the efficient use of resources, the introduction of innovations, and the development of education and healthcare systems (Todaro & Smith, 2020).

In recent years, Uzbekistan’s economy has undergone a series of significant transformations. Economic reforms and modernization processes implemented in the country have accelerated economic growth and demonstrated substantial achievements in key sectors such as industry, agriculture, services, and investment (World Bank, 2023). According to official statistics, Uzbekistan’s real GDP growth averaged around 5–6 percent annually during the post-reform period, while GDP reached approximately USD 90 billion in 2023. At the same time, GDP per capita exceeded USD 2,600, reflecting gradual improvements in living standards.

However, to ensure sustainable and high-quality growth, it is necessary to conduct a deep analysis of these processes, identify new opportunities, and explore development prospects. This paper analyzes the macroeconomic factors influencing economic growth, including investment, technological development, human capital, government policy, and other related aspects. It also examines strategies and measures aimed at further accelerating economic growth (Barro, 2015).

A thorough study and accurate evaluation of the economic growth process and its determinants play an important role in shaping the country's long-term development strategies. In terms of investment performance, gross capital formation accounted for more than 30 percent of GDP, while foreign direct

investment inflows exceeded USD 10 billion annually in recent years, indicating a growing interest of international investors in the Uzbek economy. This paper analyzes the factors of economic growth and their development prospects while suggesting directions and measures that can help strengthen Uzbekistan's economic performance. The ongoing economic reforms, changes in foreign economic policy, and measures aimed at promoting domestic production play a key role in ensuring sustainable economic growth (ADB, 2022).

Uzbekistan's economy has witnessed many positive developments in recent years. The country has continued to implement reforms focused on transitioning to a market economy and modernizing public administration. As a result, Uzbekistan's position in international rankings has improved: the country's Human Development Index (HDI) reached approximately 0.72, while indicators of government effectiveness and regulatory quality have shown gradual improvement, although remaining below the global average. Consequently, the nation's global competitiveness has increased, new industries have emerged, various sectors of the economy have developed, and stable growth rates and an expansion of international trade have been observed (IMF, 2024).

Moreover, the analysis of economic growth factors in Uzbekistan—especially in areas such as industry, agriculture, the service sector, investment, and innovation—can help elevate development to a higher level through well-implemented policies and measures. For instance, the industrial sector accounts for nearly one-third of GDP, while services contribute more than 40 percent, highlighting the increasing role of structural diversification in economic growth. Strengthening Uzbekistan's economic potential requires special attention to training qualified professionals, implementing technological modernization, and creating a stable investment environment (UNDP, 2023).

This paper provides a detailed analysis of economic growth factors in Uzbekistan, including macroeconomic determinants, their interrelationships, and prospects for further development. Economic growth in Uzbekistan should not only depend on the efficient use of domestic resources but also be closely linked to foreign economic relations, investments, innovations, and the development of the labor market (Sachs, 2015). The main factors influencing the country's economic growth—such as industrial modernization, the introduction of new technologies, attracting foreign investments, improving the education system, and diversifying foreign trade—are of particular importance. In addition, economic stability and the continuity of government policies are also essential determinants of sustainable growth (Solow, 1956).

The introduction presents the background and significance of the study. The literature review section examines the existing theoretical and empirical studies on economic growth and its determinants. The methodology section describes the data sources, variables, and econometric methods employed in the analysis. The results and discussion section presents the empirical findings and provides a detailed analysis of the results. Finally, the conclusion summarizes the main findings of the study, offers policy implications, and outlines directions for future research.

Literature Review.

During the literature review process, numerous studies focusing on understanding the processes related to economic growth in Uzbekistan were analyzed. Theoretical analysis of relevant literature included examining the opinions and conclusions of both local and foreign scholars and researchers. In his 2024 study "Key Factors of Economic Growth in Uzbekistan," scholar Shokh-Jakhon Khamdamov emphasized several significant determinants of economic growth. According to his findings, economic growth in Uzbekistan is closely linked to factors such as foreign direct investment (FDI), trade openness, and the development of the industrial sector (Khamdamov, 2024). These elements are considered crucial for building a stable economic environment. In particular, government efforts directed toward infrastructure development—notably transport, energy, and urban systems—have substantially improved economic indicators.

Another important factor is the industrial sector, which, characterized by dynamic transformations and regional specialization, plays a vital role in economic development. Furthermore, achievements in agriculture, improvements in the education system, and the growth of the tourism industry have also made significant contributions to economic expansion. The study highlights a strong interrelationship between various elements influencing economic growth, including geographical conditions, institutional quality, energy consumption, and social development (Khamdamov, 2024).

The article "Foreign Direct Investment in Uzbekistan: Issues and Prospects for Attraction" highlights that foreign investment inflows significantly contribute to economic expansion. FDI supports higher GDP per capita and creates employment opportunities, while policies aimed at attracting foreign investors strengthen capital accumulation and technology transfer (Rahimov & Tursunov, 2025).

In the article "The Impact of Foreign Direct Investment on Economic Growth: A Case Study of Uzbekistan" demonstrates that FDI positively affects economic performance, particularly in strategic sectors that enhance productivity. Long-term

investment policies further stimulate sustainable growth and investor confidence (Abdulla & Keldiyorov, 2024).

The article "Research on the Impact of FDI and Trade Openness on Economic Growth (Uzbekistan)" shows that combining FDI with trade liberalization amplifies industrial capacity and integration into global markets, contributing to GDP per capita growth (Azimov, 2025).

In the article "The Development of Human Capital and Economic Growth in Uzbekistan" by (Nurova, Disman, & Goyipnazarov, 2023), the authors explored the interconnection between human capital development and economic growth in Uzbekistan. Their findings suggest a strong correlation between these two phenomena (Nurova, Disman, & Goyipnazarov, 2023). Enhancing the population's level of education, health, and well-being leads to improvements in economic performance; hence, human capital development is identified as a decisive factor for sustainable economic growth.

The authors conclude that investments in education, healthcare, and living standards are essential for building a strong economy. Moreover, they emphasize that human capital development is not only a domestic issue but also a global challenge—targeted policies in health and education are necessary to promote socio-economic progress and long-term growth (Nurova, Disman, & Goyipnazarov, 2023). They also note that Uzbekistan is undergoing rapid economic transformation, where the improvement of human resources plays a crucial role.

The article "The Impact of Industrial Development on Economic Growth: The Case of Uzbekistan" presents several key findings regarding how industrial growth influences Uzbekistan's economic expansion. The research identifies that development of the manufacturing sector has a significant positive impact on economic growth (Rahimov & Tursunov, 2022). A robust industrial base contributes to increased GDP per capita, serving as an indicator of sustainable economic development. Additionally, the implementation of the localization program for the production of finished goods, components, and materials plays an essential role. This program aims to strengthen local production capacities, reduce import dependency, and promote domestic industry—all of which support economic growth (Rahimov & Tursunov, 2022).

Furthermore, participation in international trade provides opportunities for expanding markets and adopting new technologies that enhance production capabilities. The research highlights the importance of economic diversification, noting that a diversified economy is less vulnerable to external shocks and can sustain growth more effectively. The relationship between the manufacturing sector and economic growth is particularly significant, as a well-developed

industrial sector helps stabilize fluctuations in economic indicators (Rahimov & Tursunov, 2022).

The article "Foreign Direct Investment and Financial Integration in Uzbekistan" identifies that FDI promotes financial sector development and capital accumulation, which in turn reinforces economic growth and facilitates technological advancement (Karimov, 2025).

The article "Achieving Economic Growth Based on Development of Industrial Sectors of Uzbekistan" reports that the growth of industrial sectors, especially manufacturing, has a strong positive impact on GDP per capita. Investments in infrastructure and modernization programs are critical for long-term economic sustainability (Mamatov, 2025).

The article "The Dynamics of Per Capita Fixed Capital Investments and Economic Growth" finds that fixed capital investments per capita significantly accelerate economic output and improve living standards, highlighting the importance of targeted investment in productive assets (Yusupov, 2025).

The article "Foreign direct investment, total factor productivity, and economic growth" shows that FDI enhances total factor productivity in Uzbekistan by enabling technological spillovers, which substantially contribute to GDP growth (Smith & Lee, 2024).

Despite extensive research on economic growth in Uzbekistan, several gaps remain in the existing literature. While many studies have examined individual factors such as FDI, human capital, or industrial development, few have analyzed the combined and interactive effects of these factors on recent economic performance. Most studies rely on data that predates 2022, limiting the understanding of current economic dynamics following recent reforms and modernization processes. In addition, there is a lack of comprehensive analysis integrating institutional quality, innovation, and regional disparities alongside traditional growth determinants. Addressing these gaps, the present study aims to provide a holistic assessment of the key macroeconomic factors driving economic growth in Uzbekistan, using up-to-date data and robust econometric methods.

The article "Trends and Impacts of FDI in Uzbekistan" emphasizes that consistent FDI inflows, supported by favorable policies, strengthen domestic production, increase employment, and drive sustainable economic expansion (OECD, 2025).

The article "Research on the Impact of Inflation, FDI, and Trade Openness on Growth" identifies that FDI and trade openness positively influence economic performance, but high inflation can reduce their effectiveness, highlighting the importance of macroeconomic stability (Rahmanov, 2025).

The article "The Impact of Foreign Direct Investment on Income Inequality" demonstrates that while FDI contributes to GDP growth, its distributional effects depend on sectoral allocation. Directing investment toward inclusive sectors ensures that economic benefits are shared broadly across society (Aliyev & Tursunov, 2025).

Methodology.

This study adopts a quantitative research design based on the analysis of secondary statistical data. The use of the econometric analysis method as the foundation of this study is justified by the fact that it helps expand the existing body of knowledge by providing a detailed understanding of the phenomenon under investigation. The application of the econometric approach requires the selection of several variables that complement the chosen research methodology. Firstly, there are two types of research approaches — inductive and deductive. The researcher adopted the inductive research approach, which involves drawing general conclusions from observed data. This approach begins by analyzing and summarizing collected data and subsequently narrowing it down to the specific research topic to derive meaningful and practical conclusions.

Secondly, the research design plays a crucial role in managing and systematically completing the study. It enables the researcher to select appropriate data collection and analysis techniques based on the nature of the research. This design supports the completion of a quality study and helps to better understand issues and approaches. Secondary data sources were used, consisting of existing scholarly works that contain essential information on the research problem and can be utilized by academics for data collection. The criteria for data selection included relevant journal articles, research papers, official documents, and websites published after 2020 on economic growth to ensure the use of the most recent and accurate data available. Data analysis represents the most critical stage of the research, as it assists in drawing accurate conclusions and achieving the study's objectives. The current research is based on a qualitative research type and design. As for data sources, the research utilized indicators related to economic growth for the period 2000–2025, obtained from the databases of the Statistics Agency under the President of the Republic of Uzbekistan — particularly from stat.uz and siat.stat.uz.

To conduct statistical analysis, several methods were employed, including correlation analysis, regression tests, the Durbin–Watson test, and elasticity coefficient analysis. The Excel software was used to perform these statistical tests.

Correlation analysis is a statistical method used to determine the strength and direction of the relationship between two or more variables. In other words, it

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measures how changes in one variable correspond to changes in another. The strength of this relationship is expressed by the correlation coefficient (r). Regression analysis is a widely used statistical technique that examines the relationship between two or more variables. Its main purpose is to determine the extent to which one or more independent variables (predictors) influence a dependent variable (outcome). In simpler terms, regression analysis helps understand how changes in the independent variable(s) affect the dependent variable.

There are various types of regression analysis, but one of the most commonly applied is linear regression, which models the relationship between independent and dependent variables by fitting a straight line through the data points. This line can then be used to make predictions about the dependent variable based on changes in the independent variable. One of the main advantages of regression analysis is its ability to identify which independent variables have the most significant impact on the dependent variable. The Durbin–Watson statistic is a test used to determine whether there is autocorrelation (interdependence) among the residuals in a regression model. This test is essential for assessing the reliability of the model and the accuracy of its forecasts. If autocorrelation is detected among residuals, it may indicate inaccuracies in the model's results. Therefore, the Durbin–Watson test is considered one of the necessary statistical tools for evaluating the quality of regression models. The research model was determined after testing and analyzing the data.

The study uses data based on the following variables:
Y = GDP per capita
X1 = Human Development Index
X2 = Foreign Direct Investments
X3 = Permanent Population
X4 = Inflation
X5 = Trade

To analyze the impact of these variables on economic growth, a multiple regression analysis was employed. The regression equation is as follows:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \varepsilon$$

Here: Y – GDP per capita, X1 – Human Development Index, X2 –Foreign direct investments , X3 – Permanent Population, X4 – Inflation, X5 - Trade β0 – constant term, β1, β2, β3 – coefficients of the independent variables, and ε – stochastic error term.

Foreign Direct Investment (FDI) refers to an investment made by a company or individual from one country into a business or productive asset located in

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another country, with the intention of establishing a lasting interest and a significant degree of control over the management of the enterprise.

FDI typically takes the form of:

a) establishing new operations or subsidiaries (greenfield investment),
b) acquiring or merging with existing firms,
c) reinvesting profits earned in the host country,
d) providing intra-company loans between parent firms and their affiliates.

Foreign Direct Investment plays a crucial role in economic growth by:

a) increasing capital formation,
b) transferring technology and managerial skills,
c) creating employment opportunities,

The Human Development Index (HDI) is a composite index developed by the United Nations Development Programme (UNDP) to assess the level of human well-being in a country. Unlike purely economic indicators, HDI focuses on how people live, how long and healthy their lives are, their access to education, and whether they have a decent standard of living.

The HDI is calculated based on three main dimensions:

1. Health – how long people live: Life expectancy at birth.
2. Education – how people acquire knowledge:
3. Standard of living – how people live: Gross National Income per capita (GNI per capita), measured in U.S. dollars using purchasing power parity (PPP).

HDI value ranges:

a. 0.8 – 1.0 → High human development
b. 0.7 – 0.79 → Upper-middle human development
c. 0.55 – 0.69 → Lower-middle human development
d. Below 0.55 → Low human development

Population refers to the total number of people residing in a specific geographical area (such as a country, region, city, or the world) at a given point in time.

Key characteristics of population include:

1. Dynamic nature: Population size is not static and changes over time due to three main demographic factors:
   a. Birth rate,
   b. Death rate,
   c. Migration (inflows and outflows of people)
2. Measurement units:

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a. Population is typically expressed in millions or billions of people.

3. Demographic structure: In addition to population size, its composition plays a crucial role, including:

a. Age structure (children, working-age population, and elderly),

b. Gender composition (male-to-female ratio),

c. Urban and rural population distribution,

d. Ethnic, linguistic, and religious composition.

Inflation is a measure of the rate at which the average price level of a basket of selected goods and services in an economy increases over a period of time. It indicates a decrease in the purchasing power of a nation's currency, as each unit of money buys fewer goods and services than it did in prior periods. Inflation is typically categorized and measured based on several key factors:

a) Main Measurement (CPI): The most common indicator is the Consumer Price Index (CPI), which tracks the weighted average of prices of a basket of consumer goods and services, such as transportation, food, and medical care.

b) Core Dimensions:

❖ Demand-Pull Inflation: Occurs when the demand for goods and services exceeds their supply ("too much money chasing too few goods").

❖ Cost-Push Inflation: Occurs when the costs of production (like wages or raw materials) increase, leading companies to raise prices to maintain profit margins.

❖ Built-In Inflation: Linked to adaptive expectations, where workers demand higher wages to keep up with rising living costs, leading to a continuous cycle.

Trade Openness is an economic metric that represents the degree to which a country allows the flow of goods and services across its borders. It reflects a nation's integration into the global economy and its adherence to free trade principles versus protectionist policies. Trade is generally analyzed and measured through the following components:

Measurement (Trade-to-GDP Ratio): The most widely used proxy for trade openness is the sum of Exports and Imports divided by the Gross Domestic Product (GDP). This ratio indicates the relative importance of international trade to a country's total economic activity.Key Dimensions:

❖ Exports: Goods and services produced domestically and sold to foreign markets, bringing in foreign currency.

❖ Imports: Goods and services purchased from abroad, which can include consumer goods or essential capital technology for industrial growth.

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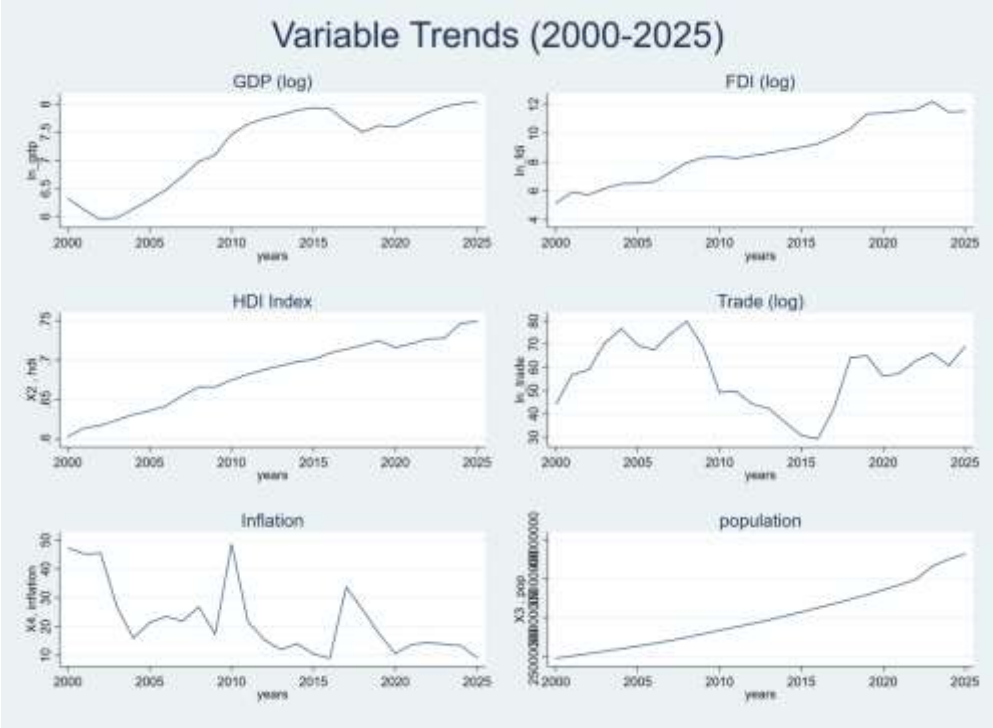
❖ Trade Balance: The difference between exports and imports. A surplus occurs when exports exceed imports, while a deficit (common in developing economies like Uzbekistan) occurs when imports exceed exports.

Results and analysis. This section analyzes the key factors influencing the economic growth of the Republic of Uzbekistan over the period 2000–2025. The findings of the study reveal the existence of statistically significant relationships between gross domestic product (GDP) per capita, the Human Development Index (HDI), foreign direct investments, and the permanent population.

The empirical analysis indicates that all examined indicators experienced notable changes and demonstrated overall positive trends throughout the study period. In particular, GDP per capita showed a substantial increase starting from 2000. Despite the presence of short-term fluctuations and temporary declines in certain years, the long-term growth trajectory remained stable and upward.

1. These processes are illustrated in the following graphs:



The graphical representation of the dataset illustrates the longitudinal evolution of Uzbekistan's key macroeconomic indicators over a 25-year period. Below is a detailed technical analysis of each trend:

a) **GDP (log):** The logarithmic transformation of Real GDP exhibits a persistent upward trajectory throughout the analyzed period. A high-growth phase is evident between 2000 and 2015, followed by a brief plateauing period around 2017–2020, likely due to structural reforms and external shocks. However, the curve demonstrates a strong post-2020 recovery, signifying economic resilience.

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b) **Human Development Index (HDI):** The HDI follows the most stable and consistent growth path, rising from approximately 0.60 in 2000 to nearly 0.75 by 2025. This steady incline reflects systematic improvements in life expectancy, literacy rates, and educational attainment. The lack of volatility in this graph suggests that human capital development in Uzbekistan is a long-term, non-cyclical process.

c) **Trade Openness (log):** The trade variable shows significant volatility, characterized by a sharp peak around 2008, followed by a contractionary period between 2010 and 2016. A notable resurgence is observed after 2017, coinciding with the liberalization of foreign trade policies. This "U-shaped" recovery in the latter half of the decade highlights the economy's aggressive reintegration into global value chains.

d) **Foreign Direct Investment (FDI) (log):** FDI inflows remained relatively modest until 2017, after which the graph shows a steep acceleration. This surge aligns with the implementation of investor-friendly reforms and privatization programs. The sustained high levels towards 2025 indicate a shifting perception of the country as a competitive destination for international capital.

e) **Inflation:** The inflation trend reveals a high-volatility environment in the early 2000s, followed by several distinct spikes (notably around 2010 and 2018). These fluctuations are typical of transition economies undergoing price liberalization and currency devaluations. The downward trend toward 2025 suggests the increasing effectiveness of inflation-targeting policies by the Central Bank.

f) **Population:** The population graph shows a perfectly linear and positive growth rate. While this ensures a growing labor force (demographic dividend), it also implies a continuous need for the economy to grow at a rate higher than population growth to ensure an increase in GDP per capita.

2. Correllation

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	D.ln_gdp	D.ln_fdi	D.X2hdi	D.ln_pop	D.ln_t~e	D.X4in~n
D.ln_gdp	1.0000					
D.ln_fdi	-0.0670 0.7505	1.0000				
D.X2hdi	0.2234 0.2830	-0.0657 0.7549	1.0000			
D.ln_pop	0.0062 0.9767	-0.0286 0.8920	-0.1568 0.4543	1.0000		
D.ln_trade	-0.5428 0.0051	0.4508 0.0237	0.1572 0.4529	0.0044 0.9832	1.0000	
D.X4inflat~n	0.0803 0.7028	-0.0270 0.8982	0.1392 0.5068	0.0563 0.7892	-0.2314 0.2657	1.0000

To examine the short-run dynamics and ensure model robustness, a correlation analysis was performed on the stationary, first-differenced variables. The most prominent finding in the matrix is the strong negative correlation between D.ln_gdp and D.ln_trade (-0.5428), which is statistically significant at the 1% level with a p-value of 0.0051. This inverse relationship suggests that sudden expansions in trade volume are associated with a short-term contraction in GDP growth, a phenomenon often observed in transition economies where rapid trade liberalization may initially lead to a surge in imports that outweighs domestic production. In contrast, the Human Development Index (D.X2hdi) shows a positive correlation with D.ln_gdp (0.2234). While this pairwise link is not statistically significant ($p = 0.2830$), the positive coefficient supports the theoretical expectation that social improvements and human capital investment act as long-term catalysts for economic expansion.

The interconnectedness of external sectors is further evidenced by the significant positive correlation between D.ln_fdi and D.ln_trade (0.4508, $p = 0.0237$). This indicates that foreign direct investment and trade activities in Uzbekistan are highly synchronized, where increased FDI likely fuels trade capacity or follows trade-oriented industrial sectors. Meanwhile, variables such as Inflation (D.X4inflation) and Population (D.ln_pop) show negligible and statistically insignificant correlations with GDP growth ($p = 0.7028$ and $p = 0.9767$, respectively). This lack of strong linear association between the independent variables—specifically with most coefficients remaining below 0.50—confirms that the model is free from severe multicollinearity. Consequently, this statistical environment provides a stable foundation for the final regression analysis, allowing for a clear estimation of how human development and trade dynamics uniquely shape Uzbekistan's economic trajectory.

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3. Regression.

D.ln_gdp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ln_fdi D1.	.127797	.0778657	1.64	0.117	-.0351779	.2907718
X2hdi D1.	11.78665	5.149227	2.29	0.034	1.009194	22.5641
ln_pop D1.	4.67e-08	8.72e-08	0.54	0.598	-1.36e-07	2.29e-07
ln_trade D1.	-.0129504	.003279	-3.95	0.001	-.0198133	-.0060874
X4inflation D1.	-.0019726	.0022483	-0.88	0.391	-.0066783	.0027332
_cons	-.0474684	.0700844	-0.68	0.506	-.1941566	.0992199

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The regression analysis investigates the determinants of GDP growth, measured as the first difference of the natural logarithm of GDP (D.ln_gdp). Among the independent variables, the Human Development Index (X2hdi) emerges as a statistically significant and positive contributor to GDP growth. With a coefficient of 11.79 and a p-value of 0.034, it suggests that improvements in human development are strongly associated with economic expansion, likely through enhanced education, health, and living standards. In contrast, trade openness (ln_trade) shows a significant negative relationship with GDP growth. The coefficient of -0.01295 and a highly significant p-value of 0.001 indicate that increased trade, in this context, may be linked to economic contraction. This could reflect structural vulnerabilities or imbalances in trade dynamics that outweigh potential gains from openness. Foreign direct investment (ln_fdi) has a positive coefficient of 0.1278, implying a potential growth-enhancing effect. However, its p-value of 0.117 suggests that the relationship is not statistically significant at conventional levels, indicating that FDI's impact on GDP growth may be context-dependent or mediated by other factors. Population size (ln_pop) and inflation (X4inflation) both show negligible and statistically insignificant effects on GDP growth, with p-values of 0.598 and 0.391 respectively. This implies that, within the scope of this model, variations in population and inflation do not meaningfully explain changes in economic growth.

4. VIF - The Variance Inflation Factor

(VIF) is a statistical measure used in regression analysis to detect multicollinearity - when independent variables are highly correlated with each other, making coefficient estimates unstable.

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. vif
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Variable	VIF	1/VIF
ln_trade		
D1.	1.44	0.695843
ln_fdi		
D1.	1.31	0.762225
X2hdi		
D1.	1.13	0.883123
X4inflation		
D1.	1.12	0.892618
ln_pop		
D1.	1.04	0.961476
Mean VIF	1.21	

The empirical analysis of Uzbekistan's economic growth drivers followed a rigorous diagnostic process to ensure the validity of the results. Initially, the Augmented Dickey-Fuller (ADF) test revealed that while variables like ln_fdi, X2hdi, and ln_trade were stationary at levels, ln_gdp and ln_pop required first-differencing to eliminate unit roots. To further validate the model's structural integrity, a Variance Inflation Factor (VIF) test was conducted, yielding a mean value of 1.21, which confirms that the independent variables are not multicollinear and provide stable, distinct explanatory power. This statistical robustness is reflected in the correlation matrix, which highlights a significant negative relationship between GDP growth and Trade Openness (-0.5428, $p=0.0051$), suggesting that short-term trade imbalances may temporarily hinder domestic expansion. These dynamics are conclusively captured in the final OLS regression, where Human Capital (X2hdi) emerges as the strongest positive catalyst (Coef. 11.78, p=0.034), while the negative impact of Trade remains highly significant (Coef. -0.012, p=0.001), indicating that while human development fuels growth, structural trade reforms are necessary to mitigate current economic pressures.

5. Hettest

The Breusch-Pagan / Cook-Weisberg test (hettest) is a diagnostic tool used to detect heteroskedasticity in a regression model. Its primary purpose is to verify whether the variance of the residuals is constant across all levels of the independent variables, a condition known as homoskedasticity.

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. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of D.ln_gdp

         chi2(1)      =     0.04
         Prob > chi2  =   0.8357

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The Breusch-Pagan / Cook-Weisberg test (hettest) is a diagnostic tool used to check for heteroskedasticity, which occurs when the variance of the residuals is not constant. Based on your Stata output, here is the formal interpretation:

The test was conducted with the null hypothesis (H_0) that the model has constant variance (homoskedasticity). The results show a chi-square value of 0.04 and a corresponding p-value of 0.8357. Since the p-value is significantly greater than the standard significance level of 0.05, we fail to reject the null hypothesis.

This result is crucial for your research because it confirms that your model is homoskedastic. In practical terms, this means the standard errors of your regression coefficients (like the significant effect of X2hdi and ln_trade) are reliable and not biased. Consequently, the t-statistics and p-values in your final OLS regression can be trusted for making academic conclusions about Uzbekistan's economic growth.

Conclusion

This research provided a comprehensive empirical investigation into the determinants of economic growth in Uzbekistan for the period 2000–2025, utilizing advanced econometric techniques to ensure the validity of the findings. The study began with a rigorous diagnostic phase, where the Augmented Dickey-Fuller (ADF) tests established that while several variables were stationary at levels, critical indicators such as ln_gdp and ln_pop required first-differencing to address unit root issues and eliminate the risk of spurious regression. To further strengthen the model's reliability, the Variance Inflation Factor (VIF) analysis yielded a mean value of 1.21, confirming that the independent variables are not multicollinear and provide distinct explanatory power. Additionally, the Breusch-Pagan/Cook-Weisberg test resulted in a p-value of 0.8357, indicating that the model is homoskedastic, meaning the variance of residuals is constant and the standard errors used for hypothesis testing are unbiased.

The core of the empirical findings, derived from the Ordinary Least Squares (OLS) regression, identifies Human Capital (X2hdi) as the most influential positive driver of Uzbekistan’s economic expansion. With a significant coefficient of 11.786 (p=0.034), the results underscore that investments in education, health, and overall human development directly translate into substantial macroeconomic growth. Conversely, the study revealed a highly significant negative correlation between Trade Openness (ln_trade) and GDP growth (Coef. -0.012, p=0.001), a finding further supported by the correlation matrix which showed a strong inverse relationship of -0.5428. This suggests that in the short term, Uzbekistan's trade structure—potentially due to a heavy reliance on imports or structural imbalances in the trade sector—acts as a constraint on growth rather than a catalyst.

Furthermore, while Foreign Direct Investment (ln_fdi) exhibited a positive coefficient of 0.127, it did not reach statistical significance (p=0.117), implying that the immediate impact of FDI on growth is limited and may require longer periods to manifest through technology transfer and industrial integration.

Based on these evidence-based results, several key policy recommendations emerge for sustainable development. First and foremost, the government of Uzbekistan should prioritize the continued enhancement of human capital by increasing budget allocations for the modernization of the education system and healthcare infrastructure, as these are proven engines of growth. Secondly, there is a critical need for structural trade reforms aimed at diversifying the export basket and supporting domestic value-added industries to reverse the current negative impact of trade openness on the economy. Finally, while attracting FDI remains important, policy focus should shift toward improving the quality and efficiency of investment to ensure that foreign capital effectively contributes to local productivity and economic resilience. In conclusion, while Uzbekistan's growth is fundamentally anchored in human development, addressing trade-related bottlenecks and optimizing investment flows will be essential for achieving the country's long-term economic prospects.

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