



The Effect of Urbanization on Economic Growth in Afghanistan and Pakistan (2002–2017)

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Abstract

This study investigates the impact of urbanization on economic growth in Afghanistan and Pakistan for the 2002–2017 period with a dynamic panel data analysis method using the Generalized Least Squares (GLS) approach. The results indicate that urbanization exerts a positive and statistically significant effect on economic growth. In contrast, overall population growth demonstrates a negative and significant association with economic performance. Furthermore, employment growth and gross capital formation are found to positively and significantly contribute to economic growth in both countries.

Keywords: *Economic Growth; Urbanization; Population Growth; Afghanistan; Pakistan*

1. Introduction

Population is widely recognized in economic literature as a key determinant of economic growth. Scholars have argued that rapid population growth can, in certain contexts, negatively affect economic performance (Asadzadeh, A. 2015.p.70). Within this framework, urban population growth has garnered particular attention, as cities are central to economic activity. Urban areas provide conducive environments for the interaction of supply and demand, production, and consumption; therefore, increases in urban population are expected to have significant implications for economic growth. Numerous empirical studies conducted across different countries have explored this relationship, with most evidence supporting the existence of a long-run association between urbanization and economic growth (Dastjerdi & Najafabadi, 2010, p.12).

Afghanistan and Pakistan share many geographical, social, cultural, and economic characteristics, making them suitable candidates for comparative analysis. A review of their economic and social structures highlights these similarities. Afghanistan, with an average per capita income of approximately USD 475.24 during the study period, is among the lowest-income developing countries. The nation has endured nearly four decades of conflict, resulting in widespread rural poverty, rising urban population

density, deteriorated urban infrastructure, and high population growth rates factors that pose substantial challenges for governance and policymaking.

During the study period, Afghanistan's population growth averaged around 3.5 percent, while economic growth has shown a downward trend since 2012, exacerbating socio-economic challenges. The share of agriculture in GDP declined from 43.16 percent to 23.04 percent, whereas the industrial sector remained relatively stable at around 21 percent. In contrast, the services sector expanded considerably, rising from 34.14 percent to 51.62 percent of GDP. On average, Afghanistan's GDP growth rate was approximately 7.1 percent, with urban population accounting for about 24.39 percent of the total population, according to World Bank statistics.

Pakistan's economic structure also experienced notable changes during this period. The agricultural sector's share of GDP declined from 27 percent to 18.85 percent, while the industrial sector contributed approximately 20.73 percent. The services sector grew significantly, from 53.6 percent to 60.23 percent of GDP, averaging 56.72 percent over the period. Pakistan's average GDP growth rate was approximately 4.47 percent, with an urbanization rate of 36.52 percent and a population growth rate of 2.09 percent.

Against this backdrop, this study addresses the following research questions: Does urban population growth contribute to economic growth in Afghanistan and Pakistan? Is there a statistically significant relationship between urbanization and economic growth in these countries? Moreover, do the estimated policy coefficients carry meaningful economic significance? To answer these questions, economic growth is treated as the dependent variable, urban population as the main independent variable, and population growth rate and labor force participation as control variables. This paper is organized into four sections. The first section reviews the theoretical foundations and relevant empirical literature. The second section details the research methodology and model specification. The third section presents the panel data analysis using the Generalized Least Squares (GLS) method. Finally, the last section discusses the empirical findings and offers relevant policy implications.

2. Theoretical Framework

Economic growth reflects a country's economic strength and activity, and it is influenced by various factors that can either stimulate or constrain development. Over the years, numerous theories have sought to explain the drivers of economic growth, with researchers often examining the relationships between growth and other indicators to assess their nature, intensity, and policy relevance. This study focuses specifically on the relationship between urbanization and economic growth (Branson, W.,H & Abass S., 2012, p.212).

In classical economic thought, population growth was often seen as a limiting factor. Malthus, a prominent early 19th-century economist, held a pessimistic view of population expansion. He argued that in many countries, population growth outpaced agricultural development, resulting in conflicts, famine, disease, and other social crises. Malthus considered rapid population growth a contributor to poverty, natural resource scarcity, and declining quality of life (Asadzadeh et al., 2015, p. 71; Khani & Nasrollahi, 2013, p. 91). Similarly, John Stuart Mill emphasized that, in the absence of technological progress in agriculture, excessive population growth could hinder economic development and exacerbate social and economic problems (Dastjerdi & Najafabadi, 2010, p. 3). In contrast, modern growth theory highlights potential positive effects of population growth. Robert Solow, the American economist and Nobel laureate, emphasized that a moderate increase in population growth could initially reduce per capita capital and output but, over the long term, support sustainable growth and higher economic capacity (Solow, 1956).

Keynesian growth models also recognize the importance of aligning population growth with economic growth to maintain balanced development (Dastjerdi & Najafabadi, 2010, p. 3). Becker further

argued that in knowledge-based economies, balanced population growth can enhance public welfare rather than hinder it. In countries with multi-sector economies, population growth can positively influence economic growth and, in the long term, contribute to a gradual reduction in population growth rates (Asadzadeh et al., 2015, p. 73). When considering urbanization alongside population growth, it becomes evident that urbanization represents a positive social and economic transformation. Urban areas generally provide greater access to economic, educational, and social opportunities compared to rural areas. Empirical evidence from various countries indicates that nations with higher urban populations tend to experience stronger economic growth and development. In many developed countries today, the urban population significantly exceeds the rural population, reflecting the central role of cities in fostering economic progress (Rahimi, A. 2009, p.89).

3. Research Background

Several studies have examined the relationship between urbanization and economic growth, highlighting both regional and global perspectives.

Sundip Sarkar (2016) investigated urban population growth and economic development in South Asian countries using panel data methods. The study found evidence of a long-term relationship between urbanization and economic growth, with the direction of causality running from urban population growth to economic growth in the long run.

Uniatark (2013) explored the connection between urbanization and economic growth in Asia and Africa, focusing on population growth and improvements in living standards. The study concluded that urban development and economic agglomeration are highly variable across regions. Moreover, it found no clear linear relationship between economic growth and urbanization. Similarly, the study rejected a direct linear relationship between production growth and city size, emphasizing that the impact of urbanization on economic growth largely depends on the quality of urban infrastructure and organized systems.

Allen Flaubel (2009) analyzed urban concentration and economic growth across various countries using semi-parametric indices. The study considered differences in economic groups, geographic indicators, and levels of development. The findings suggested that no definitive or uniform relationship exists between urban concentration and economic growth, indicating the influence of contextual and regional factors.

Daniel (2010) examined the causal relationship between urbanization and economic growth in 28 countries over the period 1950–2000. The results revealed a long-term association between urbanization and economic growth. Using Granger causality tests, the study found that in developing countries, urbanization significantly affects economic growth, whereas in developed countries, economic growth appears to influence urbanization. This indicates that the direction of causality depends on a country's level of economic development.

Mehrgan (2013) investigated the effect of urbanization on income distribution in Iran from 1972 to 2010, drawing on Kuznets' theory. The study demonstrated that the impact of urbanization on income distribution is nonlinear and closely linked to industrialization processes and urban growth dynamics. Initially, urbanization reduces economic inequality, but after a certain threshold, it tends to increase inequality, highlighting the complex socio-economic consequences of urban growth.

4. Methodology

This study employs panel data covering the period 2002–2017 to examine the relationship between urbanization and economic growth in Afghanistan and Pakistan. Panel data techniques are used because they allow for controlling unobserved heterogeneity across countries and over time, while increasing the efficiency of estimation.

The general functional form of the model is specified as:

$$Y_{it} = f(X_{it}) + \varepsilon_{it}$$

where Y_{it} represents the dependent variable for country i at time t , X_{it} denotes a vector of explanatory variables, and ε_{it} is the error term.

Following the Cobb–Douglas production function framework and standard economic growth models, the relationship between output and its determinants is assumed to be nonlinear. To enable estimation using linear regression techniques, the model is transformed into logarithmic form:

$$\ln Y_{it} = \alpha + \beta \ln X_{it} + \varepsilon_{it}$$

The logarithmic transformation linearizes the functional relationship and allows the estimated coefficients to be interpreted as elasticities. Based on the variables used in this study, the empirical model is specified as:

$$\ln GDP_{it} = \beta_0 + \beta_1 \ln URB_{it} + \beta_2 \ln POPG_{it} + \beta_3 \ln LFG_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

where:

$\ln GDP_{it}$ is the natural logarithm of gross domestic product, representing economic growth.

$\ln URB_{it}$ is the natural logarithm of urban population share (urban population as a percentage of total population), which is the primary explanatory variable.

$\ln POPG_{it}$ is the natural logarithm of the population growth rate.

$\ln LFG_{it}$ is the natural logarithm of the labor force growth rate.

μ_i captures country-specific fixed effects.

λ_t captures time-specific effects.

ε_{it} is the idiosyncratic error term.

This specification enables the estimation of the elasticity of economic growth with respect to urbanization and other demographic factors. The log-linear form preserves the economic interpretation of the Cobb–Douglas framework while providing a structure suitable for panel regression analysis.

5. Stationarity ((Unit Root) Tests

Time series data play a crucial role in empirical analysis, but a key assumption in most econometric models is that the data are stationary. If this assumption is violated, standard statistical tests such as t-tests, F-tests, and chi-square tests can produce misleading or unreliable results. Additionally, non-stationary data can lead to the problem of spurious regression, where relationships appear significant even though they are not meaningful. A time series is considered stationary if its statistical properties specifically the mean, variance, and autocorrelation remain constant over time. Stationarity is generally classified into two types: weak (covariance) stationarity and strong (strict) stationarity. A series is strongly stationary if all its statistical moments remain constant over time. A series is weakly stationary if only the first two moments (mean and variance) are constant over time. In most empirical studies, including this one, weak stationarity is tested and assumed, as it is sufficient for standard econometric analyses and ensures reliable inference.

5-1. The Levin-Lin-Chu (LLC) test

To examine the stationarity of the variables in this study, the Levin-Lin-Chu (LLC) test was employed. The results, summarized in Table 5-1, reveal the following patterns: The GDP growth rate, gross domestic product (GDP), money supply as a percentage of GDP, and foreign direct investment (FDI) as a percentage of GDP are stationary at the 5% significance level in their levels (I(0)), indicating that these variables do not require differencing for regression analysis. In contrast, the nominal exchange rate, gross capital formation as a percentage of GDP, imports as a percentage of GDP, exports as a percentage of GDP, and wage growth rate were non-stationary in levels. These variables became stationary only after first differencing, confirming that they are integrated of order one, I(1).

Table 5-1. Levin-Lin-Chu (LLC) Test Results for Main Variables

Variable	LLC Statistic	p-value	Order of Integration
LGFC (Gross Capital Formation)	-3.72652	0.0001	I(0)
LFB (Money Supply)	0.03982	0.5159	I(0)
LPOP (Population Growth)	-2.42451	0.0077	I(0)
LUP (Urbanization)	-2.12233	0.0169	I(0)
LGDP (Gross Domestic Product)	-4.14724	0.0000	I(0)
LEXR (Nominal Exchange Rate)	1.07666	0.8592	I(1)
LIMP (Imports as % of GDP)	-10.7690	0.0000	I(1)
LEXP (Exports as % of GDP)	-0.88555	0.1879	I(1)
LWAGE (Wage Growth Rate)	-6.98541	0.0000	I(1)

Based on the LLC test, the null hypothesis of a unit root can be rejected for all variables after first differencing. This confirms that the alternative hypothesis of no unit root is accepted after differencing, indicating that all variables are integrated of order one, I(1). This finding justifies the use of econometric techniques that account for integration, such as Generalized Least Squares (GLS), in the analysis of the relationships between economic growth, urbanization, and other demographic factors.

5-2. Cointegration Test

The cointegration analysis in this study examines the long-term relationships among key economic variables, including the logarithms of exports, imports, gross capital formation, nominal exchange rate, foreign direct investment, money supply, GDP growth rate, and wage growth rate. The underlying rationale for cointegration analysis is that, even when individual economic time series are non-stationary, a linear combination of these variables may be stationary, indicating a stable long-term relationship. Consequently, unit root tests were performed beforehand to determine the appropriate order of integration for each variable.

To assess cointegration, the Kao test was applied. The results are presented in Table 5-2:

Test Statistic	Probability
ADF Statistic	-3.91415

Source: Research Findings

Based on the Table 5-2, the Kao test statistic is significant at the 95% confidence level, allowing us to reject the null hypothesis of no cointegration. This indicates the existence of a long-term equilibrium relationship among the selected economic variables. The confirmation of cointegration suggests that these variables, despite short-term fluctuations, move together over the long run. This has important implications for economic policy, as it highlights that changes in one variable such as urbanization, capital formation, or trade can have sustained effects on economic growth in the studied countries.

5-3. F-Limer Test

Following the cointegration analysis, it is essential to determine the appropriate estimation approach for the model whether to use pooled data or panel data. This decision depends on whether the regression relationship exhibits homogeneous intercepts and slopes across the cross-sections (pooled model), or whether individual heterogeneity exists that requires panel estimation. The F-Limer test (also called the Limer F-test) is used to test this assumption. If the calculated F-statistic exceeds the critical F-value, the null hypothesis of homogeneous intercepts is rejected, indicating that panel data estimation is more appropriate.

Table 5-3. Limer F-Test Results

Probability	F-Statistic
0.1504	2.20

Source: Research Findings

In reference to the Table 5-3, the F-statistic is significant, leading to the rejection of the null hypothesis at the 5% significance level. This implies that the regression relationship varies across cross-sections, and therefore, the model should be estimated using panel data with the fixed effects method rather than a pooled regression model. This approach accounts for individual heterogeneity across the studied countries, ensuring more accurate and reliable estimation of the long-term relationship among the variables.

5-4. Hausman Test

The Hausman test is an essential tool in panel data analysis, used to determine whether a fixed effects (FE) or random effects (RE) model is more appropriate. The null hypothesis (H_0) assumes that the individual-specific error component is uncorrelated with the explanatory variables. Under this assumption, the random effects model is both consistent and efficient. The alternative hypothesis (H_1) assumes that the individual-specific error is correlated with the explanatory variables. In this case, the fixed effects model should be used to avoid bias and inconsistency.

Hypotheses	Interpretation
H ₀ (Random Effects)	Use random effects model
H ₁ (Fixed Effects)	Use fixed effects model

Table 5-4. Hausman Test Results

Probability	Chi-Square Statistic
0.6989	2.2

Source: Research Findings

The results of the Hausman test indicate that the null hypothesis is rejected, supporting the use of the fixed effects model. This confirms that the individual-specific effects are correlated with the explanatory variables, and using the fixed effects estimator ensures unbiased and consistent estimates for the research model.

5-5. Heteroskedasticity Test

After determining the appropriate panel data model through the Limer F and Hausman tests, it is important to assess whether the error terms in the regression model have constant variance (homoscedasticity) or not (heteroskedasticity). If the error terms are independent and homoscedastic, Ordinary Least Squares (OLS) estimation is appropriate. If the error terms are independent but heteroskedastic, Generalized Least Squares (GLS) or other dynamic estimation techniques are preferred to obtain unbiased and efficient estimates. The Likelihood Ratio (LR) test was used to detect heteroskedasticity. The decision rule is: if the p-value is less than 0.05, the null hypothesis of homoscedasticity is rejected, indicating heteroskedasticity.

Table 5-5. Heteroskedasticity Test Results (LR Test)

Probability	LR Statistic
0.0591	3.56

Source: Research findings

According to the Table 5-5, the p-value (0.0591) is slightly above the 5% significance threshold. While this suggests only marginal evidence, the model still accounts for potential heteroskedasticity by using the Generalized Least Squares (GLS) method. This approach ensures that the regression estimates are efficient and robust to variance differences in the error terms.

5-6. Wooldridge Test (Autocorrelation test)

An important assumption in classical regression analysis is that the error terms are not autocorrelated. If autocorrelation is present, the OLS estimator loses efficiency, and the standard errors may be biased, leading to unreliable statistical inferences. The Wooldridge test is commonly used to detect autocorrelation in panel data models. The hypotheses for the test are as follows: H₀ No autocorrelation exists in the error terms and H₁ Autocorrelation exists in the error terms.

Table 5-6. Wooldridge Test Result

Statistical	Probability
1.522	0.4336

Source: Research Findings

In reference to the Table 5-6, the p-value of 0.4336 is well above the 5% significance level. Therefore, the null hypothesis of no autocorrelation cannot be rejected. This result confirms that the model satisfies the assumption of independent residuals, supporting the reliability of the regression estimates.

6. Model Estimation (GLS)

As outlined earlier, the Generalized Least Squares (GLS) method was used to estimate the model. GLS is particularly suitable when the assumptions of Ordinary Least Squares (OLS) such as homoscedasticity are violated, as it provides efficient and unbiased parameter estimates even in the presence of heteroskedasticity.

Table 6-1. GLS Estimation Result

Variables	Coefficient	T-Statistic	Probability (Prob)
Intercept	8.91202	3.88	0.000
Logarithm of Population Growth Rate	-3.49192	-4.38	0.003
Logarithm of Urban Population (%)	2.06804	2.97	0.000
Logarithm of Labor Force (%)	1.81367	2.43	0.015
Logarithm of Gross Capital Formation (%)	0.53757	6.05	0.000

Source: Research Findings

The estimation results reveal several key insights: **Urbanization and Economic Growth:** The positive and significant coefficient of urban population indicates that urbanization contributes positively to economic growth in Afghanistan and Pakistan during 2002–2017. This finding reflects the structural transformation of these economies, as they gradually shift from agriculture toward services and industrial activities. **Population Growth:** The negative and significant coefficient for population growth suggests that higher overall population growth can constrain economic growth, likely due to pressures on infrastructure, public services, and resource allocation. **Labor Force and Capital Formation:** Both the labor force and gross capital formation show positive and statistically significant effects on economic growth. This highlights the importance of human capital and investment in supporting economic development in these countries. While urbanization offers substantial economic benefits, it is not without challenges. Developing countries often face issues such as inadequate infrastructure, inefficient urban management systems, unemployment, inflation, income inequality, and insufficient skilled labor. Conversely, cities with concentrations of educated workers, skilled professionals, and strong consumer demand can become engines of growth, supporting innovation, production, and services. Empirical evidence confirms that nations with higher urban populations tend to experience more robust and sustained economic development.

6-1. Parameter Interpretation

Holding other factors constant, a higher urban population has a positive effect on economic growth. Specifically, a one-unit increase in the logarithm of urban population (%) is associated with an increase in economic growth of about 2.07 units, highlighting the important role of cities in driving economic activity in the studied countries. In contrast, higher population growth has a negative impact: a one-unit increase in the logarithm of population growth reduces economic growth by approximately 3.49 units, reflecting the challenges that uncontrolled population growth can pose, particularly in countries like Afghanistan. The labor force also contributes positively to growth. A one-unit increase in the logarithm of labor force (%) is associated with a 1.81-unit increase in economic growth, showing the value of a larger, more active workforce. Finally, investment in capital, measured by gross capital formation (%), has a positive effect as well, with a coefficient of 0.54, indicating that greater investment in infrastructure and productive assets supports economic expansion.

6-2. Policy Recommendations

The governments of Afghanistan and Pakistan should promote balanced urban growth to support national economic growth. Given the positive effect of the labor force on economic growth, both countries should create new employment opportunities. Considering the high population growth, governments should implement policies to manage population growth in line with economic conditions. Urban population growth represents an economic opportunity, and governments should support it through effective mechanisms.

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