Urbanization and Income in Bangladesh: An Empirical Analysis

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ABSTRACT

This paper investigates the causal relationship between urbanization and per capita income of Bangladesh for the sample period of 1972- 2018. Both the Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests are applied to find the existence of unit root in each of the time series data collected from World Development Indicators (WDI). To observe the long-run relationship between urbanization and per capita income this study relies on Johansen- Juselius cointegration technique. Empirical results of this paper confirm the presence of long-run relationship between the variables. The Granger causality test shows that causality between urbanization and per capita income is bi-directional. Impulse Response Function and Variance Decomposition analyses are performed for robustness check.

1. Introduction

In the present world, urbanization is a major social and economic phenomenon as it reinforces the level of economic progress of a country. There has been a continuous influx of rural population into urban areas in Bangladesh during the last few decades as urbanization has expanded. In this paper, urbanization is defined as the percentage of total population living in urban areas of Bangladesh. It indicates the share of urban population in the entire inhabitants of the country. This study takes Gross Domestic Products per capita as a proxy to measure the level of income. Though urban centers are fewer than rural areas in Bangladesh, the share of the people living in urban settlements has been growing over time as a result of commercialization, industrialization, availability of better social advantages, job prospects,   non-farm work opportunities in towns and cities. Over the last four decades, urbanization of Bangladesh has grown from 15.801 % in 1981 to 36.63 % in 2018. Annual GDP per capita growth rate of Bangladesh has gone up from 1.10% in 1991 to 6.73% in 2018. Hence, both the urbanization and income have maintained upward trend over time. Henderson (2010) stated that the connection between

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urbanization and economic growth is quite common. The analysis of the link between urbanization and per capita income has been a matter of empirical study for many years. Thus study on the relationship between urbanization and rise in per capita income in developing country like Bangladesh has significant and rational importance for future course of action. This paper attempts empirically to look into the causal correlation between urbanization and per capita income in Bangladesh.

This paper is divided into six sections. After introducing the issues in section 1.0, a brief review of literature is presented section in 2.0 Section 3.0 throws a birds' eye view on the trends of urbanization and economic development in Bangladesh. Section 4.0 postulates the data and methodology. The analysis of the result is presented in section 5.0 Finally, section 6.0 concludes the paper with policy implications.

2. Literature review

It is a contentious dispute whether urbanization contributes to economic growth of a given nation or not. Researchers were divided in their conclusions, some found positive, some negative and some found no significant relationship between urbanization and economic growth for different economic condition.

Mills et al (1986) conducted a comprehensive analysis of Indian urbanization, relating it to economic development during the twentieth century and found a positive association between the urbanization and per capita GNP. Jones and Kone (1996) suggested a strong positive relationship between the level of GDP per capita and the share of the population living in the urban areas in 114 countries. Rosenthal and Strange (2003) found that doubling the urbanization can result in an increase of 3 to 8 percent of gross domestic product in high-income countries. Hu (2003) found urbanization as one of the major drivers of economic development of China. Using the time series data, Zhao (2006) found that there existed both the short-term and long-term relationship between urbanization and economic development in China. Quigley (2007) studied on urbanization of Mexico City and found the evidence of considerable contribution of urbanization to the GDP. Chen et al. (2014) found close relationship between urban concentration and GDP per capita for few decades in worldwide perspective.   Blum and Strange (2010) argued that efficiency in urban areas is raised through urban concentration which causes economic expansion. Brantley and George (2013); Sandip et al (2016) found causality between urbanization and economic growth in some selected countries. Kasman and Duman (2015) found a short-run causality moving from urbanization to GDP in EU associate nations.

Rapid urbanization may negatively affect economy through destroying socio economic environment. Rakodi (2004) argued that urban areas of low and medium-income countries are confronted with the challenges of high influx of population with unaccompanied economic growth. (Alam et al. (2007), Polese (2005) and Shabu (2010) found weak linkage between urban growth and economic improvement in rising countries. Sarker et al (2016) found no relationship between them in the short run in case of South Asia. Turok and McGranahan (2013) put arguments that organizational transformation brings economic growth but not urbanization.

The above studies demonstrate the impact of urban growth on economic development for different individual country and group of countries. To the best of our knowledge, there is hardly any study showing the causality between urban speed and per capita income for Bangladesh. The purpose of this paper is to investigate-whether urbanization and income cause each other in Bangladesh.

3. Urbanization and economic development in Bangladesh: A brief overview

Bangladesh has a vast number of populations, greater part of them are living in rural region.   But for the last few decades, the share of total population living in u jnrban areas has been growing remarkably. According to the Bangladesh Bureau of Statistics there are 532 urban centers in Bangladesh. Bangladesh population and housing census 2011 shows that the total urban area is 8867.42 Sq.km. with a total of 42.11 million people which constitute 28.40% of the total population. Table 1 shows substantial rise in urban population during the last three decades. In 1974, total urban population was only 6.27 million which increased to 28.61 million and 42.11 million in 2001 and 2011 respectively (see table1). Growth rate of urban population was 4.12 % in 2011 census year.
Table 1.

Growth of urban population in Bangladesh between census year 1974 and 2011.

Census year	Total urban population (million)	Growth rate of urban population (%)
1974	6.27	6.66
1981	13.23	10.66
1991	20.87	4.56
2001	28.61	3.15
2011	42.11	4.12

Source: Population Census, BBS

Urban density is showing a rising tendency over time. Dhaka division has the highest density with 7444 persons per sq.km in 2011 whereas it had 4457 persons per sq.km in 2001.On the other hand, Barisal division has the lowest density(see table 2).

Table 2.
Density of Urban Population (sq. km.) by Division, 2001-2011

Name of Division	Density (sq.km.) 2011	Density (sq.km.) 2001
Barisal	2046	1843
Chittagong	2804	1852
Dhaka	7444	4457
Khulna	2555	2411
Rajshahi	2780	2239
Rangpur	2416	2082
Sylhet	3075	2364

Source: Population and Housing Census, 2011

With the urbanization, the economy of Bangladesh has been experiencing a remarkable change. At present urban sectors' contribution to the economy are escalating day by day. The contribution (at constant prices of 1984-85) of the urban sector to GDP of Bangladesh grew from 25.36% in 1972-73, to 43% in 2000-2001 and 65% in 2012-14(see table 3).

Table 3.
Urban Sector's Contribution to GDP in Bangladesh during 1972-73 to 2012-14

	Contribution at constant market prices of 1984-85 (% of total)	
Year	Urban Sector	Rural Sector
1972-73	25.36	74.64
1975-76	25.47	74.53
1979-80	29.25	70.75
1982-83	29.81	70.19
1985-86	32.26	67.74
1988-89	35.41	64.59
1991-92	36.39	63.61
1995-96	45.00	55.00
1998-99	42.00	58.00
2000-01	43.00	57.00
2009-10	60.00	40.00
2012-14	65.00	35.00

Source: Bangladesh Bureau of Statistics and Bangladesh Population Census

The BBS data (2000) show that regional contribution of greater Dhaka division accounts for 43.5% to national GDP which is the highest among the old four divisions, and the contribution of Khulna accounts for 24.5% (lowest) (see table 4).

Table 4.
Rank of Urbanization Level and Share of Regional GDP in Bangladesh (FY2000)

Greater Regions/ Old Four Divisions	Rank of Urbanization Level (calculated from aggregated districts data)	Regional Share of GDP(% of total)
Dhaka	1st	43.5
Chittagong	2nd	24.5
Rajshahi	3rd	20.4
Khulna	4th	11.6
	Total	100

Source: Bangladesh Bureau of Statistics (2000)
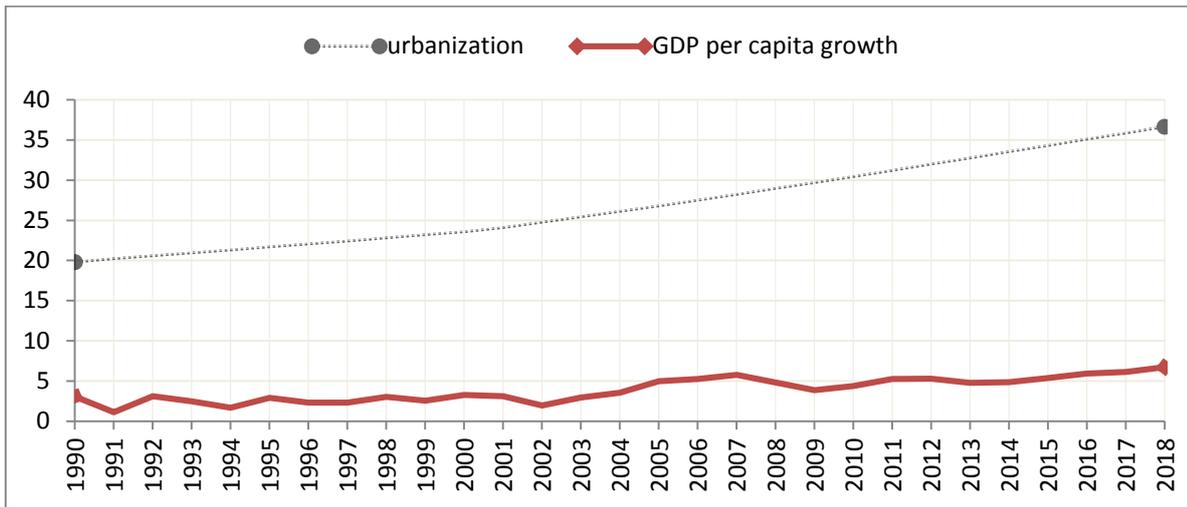
Figure 1. Urbanization and per capita GDP growth of Bangladesh (1990- 2018*)*

Source: WDI (World Development Indicators)

Share of urban population has shown rising trend during 1990-2018 (see figure 1). It grew up from 19.81 percent in 1990 to 36.63 percent in 2018. With some fluctuations during 1990 to 2002 the per capita GDP growth shows upward trend from 2003 till 2008 and maintains steady growth from 2009 to 2018. GDP per capita growth rate was only 1.11% in 1991, and it has increased to 6.74% in 2018.

4.0 Data and methodology
4.1 Data
The aim of this paper is to take a look at the causality between urbanization and economic growth. This paper is mainly based on secondary data. The data used in this study are obtained from the World Bank's World Development Indicators (WDI). The data set comprises of yearly time series data of Bangladesh covering the sample periods of 1972 to 2018. After compilation of the data, empirical results are obtained by using MS Excel and econometric program Eviews.

4.2 Methodology
The causal relationship between urbanization and economic growth is performed in the several steps. First, by using the Augmented Dickey-Fuller (ADF) test proposed by Dickey and Fuller (1979, 1981) and Philip Perron (PP) suggested by Phillips (1987) and Phillips and Perron (1988) the time series are examined for unit roots. Second, a cointegration analysis is performed among the variables to find out whether there exist co-integrating vector(s). Although cointegration confirms a stable long run association between the variables but this equilibrium may not exist in the short run. The last step of the analysis is to test for causality between the variables. Granger causality determines whether one time series is instrumental in predicting another. A variable (Y) Granger-causes another (Z) if the current value of Z can be forecasted with greater precision by using previous values of Y. If Y Granger-causes Z, then the causality goes from Y to Z and If Z Granger-causes Y, then the causality goes from Z to Y. The causal relationship is unidirectional in both cases. But bi-directional causality occurs when both variables Granger-cause each other.

5.0 Findings and analysis
5.1 Integration test
Time series data requires carrying out a unit root test to identify whether the variables are stationary and to verify their orders of integration. Both the Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests are used to find the existence of unit root in each of the time series.

Said and dickey (1984) develop the autoregressive unit root test to provide general ARMA (p, q) models with unidentified orders. Their test is known as the Augmented Dickey Fuller (ADF) test which is based on estimating the following regression:

$$y_t = \beta' D_t + \phi y_{t-1} + \sum_{j=1}^{p} \psi_j \Delta y_{t-j} + \varepsilon_t$$

Where D_t refers to a vector of deterministic terms (constant, trend etc.) The ρ (lagged difference terms) and Δy_{t-j} are used to estimate the ARMA arrangement of the errors, and ρ value is set so that the error

ε_t is successively uncorrelated. The error term is assumed to be homoskedastic. Where the ADF tests use a parametric autoregression to estimate the ARMA arrangement of the errors in the test regression, the PP tests disregard any sequential correlation in the test regression. The test regression for the PP tests is given by

$$\Delta y_t = \beta' D_t + \pi y_{t-1} + u_t$$
$$u_t \approx I(0)$$

Where u_t is I(0) and may be heteroskedastic. The PP tests correct for any sequential (or serial) correlation and heteroskedasticity in the errors u_t of the test regression by directly modifying the test statistics $t_{\pi=0}$ and $T\hat{\pi}$. These modified statistics, denoted Z_t and Z_π are given by

$$Z_t = \left(\frac{\hat{\sigma}^2}{\hat{\lambda}^2}\right)^{1/2} \cdot t_{\pi=0} - \frac{1}{2}\left(\frac{\hat{\lambda}^2 - \hat{\sigma}^2}{\hat{\lambda}^2}\right) \cdot \left(\frac{T \cdot SE(\hat{\pi})}{\hat{\sigma}^2}\right)$$

$$Z_\pi = T\hat{\pi} - \frac{1}{2}\frac{T^2 \cdot SE(\hat{\pi})}{\hat{\sigma}^2}(\hat{\lambda}^2 - \hat{\sigma}^2)$$

Table 5.

Test for Integration (Augmented Dickey Fuller)

Variables	Augmented Dickey Fuller (Intercept)		Augmented Dickey Fuller (Trend and Intercept)	
	Level	1st Diff.	Level	1st Diff.
LNPCGDP	-0.885862	-6.078440***	-3.487078	-6.005439***
LNURBAN	-1.463935	-6.003733***	-4.562581**	-5.914654***

Notes: ***, ** and * indicate rejection of the null (variables   are unit root/ non stationary)   at the 1%, 5% and 10% level respectively.

The test results of unit root above indicate in most cases, the presence of unit roots in the original series i.e. I(0) at their levels. The results test, both ADF and PP, indicate that at 1st   differences of the variables per capita income and rate of urbanization are statistically significant at 1% significance level and also confirms that all the variables are stationary in the first differenced series i.e., I(1) in all cases. This provides the basis for the test of long run relationship among the variables.

Table 6.

Test for Integration (Phillips Perron)

Variables	Phillips Perron (Intercept)		Phillips-Perron (Trend and Intercept)	
	Level	1st Diff.	Level	1st Diff.
LNGDPPC	-0.705872	-9.964730***	-3.607407	-9.379775***
LNURBAN	-1.407306	-8.860531***	-4.527116**	-8.669667***

Notes: ***, ** and * indicate rejection of the null (variables   are unit root/ non stationary)   at the 1%, 5% and 10% level respectively.

5.2   Cointegration test

A cointegration relationship in the model indicates that per capita GDP and rate of urbanization share a common trend and long run equilibrium according to theory. Johansen- Juselius co integration technique is used in this paper. Johansen advocates two diverse likelihood ratio tests of the significance of the canonical correlations and thus the reduced rank of the matrix: the trace test and maximum eigen value test i.e.

$$\lambda_{trace(r)} = -T \sum_{i=r+1}^{k} \ln(1 - \hat{\lambda}_i)$$

$$\lambda_{\max(r,r+1)} = -T \ln(1 - \hat{\lambda}_{r+1})$$

Here T refers to the sample size and $\hat{\lambda}$ is the ith   largest canonical relationship. The null hypothesis of r cointegrating vectors against the alternative hypothesis of n cointegrating vectors is tested by the Trace. On the other hand, the null hypothesis of r cointegrating vectors against the alternative hypothesis of $r+1$ cointegrating vectors is tested by the maximum eigenvalue test. The null hypothesis of Cointegration test states that variables are not cointegrated. We can reject the null hypothesis of no Cointegration if calculated Trace statistic or Max Eigen Value goes beyond the critical value.

The Johansen test statistics demonstrate rejection for the null hypothesis of no co-integrating vectors under both the trace and maximal Eigen value forms of the test.

Table 7.

Unrestricted Conintegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.683599	52.80631	18.39771	0.0000
At most 1 *	0.101070	4.475082	3.841466	0.0344

Trace test indicates 2 co integrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

In case of the trace test, the null of no co-integrating vectors is rejected since the test statistic of 52.80631 is greater than the 5% critical value of 18.39771. Moving on to test the null of at most 1 co-integrating vectors, the trace statistic is 4.475082, while the 5% critical value is 3.841466, so that the null hypothesis is rejected at 5%. and so on. Finally, results indicate the existence of at least one co integrating relationship among the variables in the series.

Table 8.

Unrestricted Conintegration Rank test (Maximum Eigen Value)

Hypothesized No. of CE(s)	Eigen value	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.683599	48.33123	17.14769	0.0000
At most 1 *	0.101070	4.475082	3.841466	0.0344

Max-eigenvalue test indicates 2 co integrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

In the maximum Eigen value test, we reject the null of no co-integrating vectors since the test statistic of 48.33123 is greater than the 5% critical value of 17.14769. In case of the null of at most 1 co-integrating vectors, the maximum Eigen value statistic is 4.475082, while the 5% critical value is 3.841466. So, the null hypothesis is rejected at 5%. Finally, max results indicate the existence of at least one co integrating relationship among the variables in the series.

Table 9.

Long-run impact of PCGDP and Rate of urbanization of Bangladesh

Variables	Normalized co integrating coefficients	Standard Error
LNGDPPC	8.582412	(0.36426)

The values of the normalized co integrating coefficient indicate that in the long run the explanatory variable is positively related to per capita income. In the long run 1% increase in per capita income leads to almost 8.582412% increase in rate of urbanization. This long run equilibrium relationship between GDPPC and urbanization is statistically significant as the t values are greater than 2 at 5% significance level.

5.3   Granger causality test

Granger causality approach is used to check the direction of causality between urbanization and per capita income. The last step of our analysis is to test for causality between the variables. The results are presented in Table 10.

Table 10.

Granger causality test

Null Hypothesis:	F-Statistic	p-value	Granger Causality
LNURBAN does not Granger Cause LNGDPPC	8.42796	0.0010*	Yes
LNGDPPC does not Granger Cause LNURBAN	8.35579	0.0010*	Yes

Note: * indicates statistically significant at the 5% level

The Granger causality results indicate that urbanization is Granger cause of per capita income and per capita income is Granger cause of urbanization. Hence, there is bi-directional causality between the variables.

5.4   Impulse response function

Figure 2 displays Impulse response function of each variable to a positive one unit standard deviation shock. Due to one SD shock to GDP per capita, initially negative response of urbanization to income is observed until second year when it hits its steady state value from where it starts increasing and remains in the positive region. Initially stable response of GDP per capita to urbanization is observed; it starts decreasing gradually after one and half year.
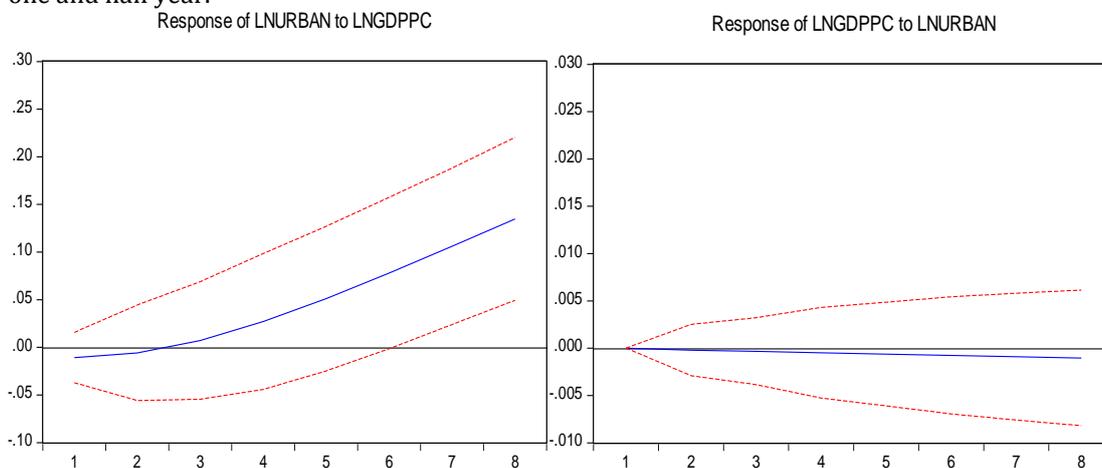
Figure 2. Impulse response of one SD Shock

5.05   Variance decomposition

The consequences of Variance Decomposition over a 10 year horizon for GDP per capita shock and urbanization shock are reported in table 11 and table 12 respectively. It is observed from Table 11 that the contribution of GDP per capita shock to urbanization is 3.9% in 3 year period and it increases to 6% in 7th year. From Table 12 we can observe that the contribution of urbanization   shock to GDP per capita is 3% in 2 year period and it increases to 26% and 38.1% in7th and 10th year respectively.

Table 11.

Variance Decomposition of LNGDPPC

Period	S.E.	LNGDPPC	LNURBAN
1	0.012080	100.0000	0.000000
2	0.015638	96.45153	3.548470
3	0.019489	96.09063	3.909370
4	0.022786	95.18130	4.818700
5	0.026025	94.64009	.
6	0.029206	94.22364	5.776364
7	0.032359	93.96613	6.033867
8	0.035502	93.82740	6.172600
9	0.038651	93.76826	6.231742
10	0.041825	93.75941	6.240593

Table 12.
Variance decomposition of LNURBAN

Period	S.E.	LNGDPPC	LNURBAN
1	0.081595	0.254883	99.74512
2	0.182371	2.960674	97.03933
3	0.285929	7.932330	92.06767
4	0.377982	12.64304	87.35696
5	0.453916	17.26188	82.73812
6	0.515906	21.67888	78.32112
7	0.568174	25.94800	74.05200
8	0.614651	30.09327	69.90673
9	0.658205	34.13145	65.86855
10	0.700687	38.06447	61.93553

6.   Conclusions and recommendation

The main purpose of this paper is to identify whether or not urbanization and economic growth cause each other based on the data over the period of 1972-2018 of Bangladesh. The empirical analyses are carried out using the time series econometric techniques. By using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests it has been found that all the variables are non-stationary at their levels and stationary at first differences. Then using Johansen Juselius technique it has been found that all the variables are cointegrated, implying that there is long run stable relationship among the study variables. The Granger causality result indicates that urbanization is granger cause of per capita income and per capita income is granger cause of the urbanization. Hence, there is bi-directional causality between urbanization and per capita income. Impulse response function analysis suggests that GDP per capita shock affects urbanization and urbanization affects GDP per capita in the long run. Variance decomposition results also suggest that economic growth shock affect urbanization and urbanization affects GDPPC. As Bangladesh mostly practices uncontrolled urbanization, the findings of this paper have important policy implications. Government and policy makers should devise policy to make planned urbanization for sustainable economic growth, social and environmental sustainability and for reducing overcrowding and unemployment.

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