

Public Debt and Economic Growth: Evidence from Bangladesh

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Bangladesh has been relying heavily on public debt to meet its budget and balance of payment deficit since independence. This study examines how public debt in Bangladesh may influence its economic growth. For this purpose two models, Investment model and Growth model, have been used in this study. The investment model has been used to investigate the potential indirect effect of public debt on economic growth through its impact on investment. In the growth model direct relationship between public debt and economic growth has been examined. The study period is 1974 to 2014. Augmented Dickey-Fuller test has been used to diagnose whether time series data are non-stationary. A TSLS regression is run to estimate those models. The estimated results show that public debt is positively related to both investment and economic growth. The empirical findings also suggest that public debt has an indirect positive effect on growth through its positive influence on investment.

Index terms— public debt, investment, economic growth, TSLS.**1 Introduction**

he issue of overall public debt has long been a major concern for policy makers of both fiscal and monetary authority in Bangladesh. Bangladesh after independence opted for economic planning with a leading role assigned to the public debt on the consideration that it shall be used for planned investment to achieve rapid economic growth. Given the present trend towards incurring public debt, it is important to know how public debt may influence economic growth. What empirical evidence exists on the direct relationship between public debt and economic growth? Does public debt have an indirect impact on economic growth through its impact on investment? If public debt negatively influences economic growth directly or indirectly, policy makers need to be aware of these relationships when formulating and implementing macroeconomic policy. On the other hand, if debt enhances economic growth, or at a minimum does not present obstacles to capital formation and hence growth, the case for public debt may be strengthened and policy makers need to focus their attention on the potential influences of public debt. However, it is important for overall macroeconomic policy to manage the debt and it needs to be coordinated closely with fiscal, monetary and other macroeconomic policies.

Furthermore, the relationship between public debt and economic growth is much debated one. There is no agreement among economists whether financing government expenditure by incurring debt is good, bad or neutral in terms of its real effects, particularly on investment and growth. As far as the relationship between debt and economic growth is concerned, a reasonable level of debt for developing country is likely to enhance growth, through capital accumulation and productivity growth (Chowdhury, 2001). Some macroeconomic theory tells that public expenditure has a positive impact on growth. Supporting this theory, an earlier study (Freeman & Webber, 2009) found that the productive type of public expenditure in education and health can lead to long-term economic returns. On the other hand, if the majority of public expenditure is channeled to unproductive types of expenditure, it may 2014).

Public debt is the amount of money owed by the government to institutions, government agencies and other bodies either resident in or outside a country (Hassan & Akhter, 2012). It can be classified in two ways: domestic public debt and external debt. When debts are owed to residents within a country, it is known as domestic debt.

4 III. PUBLIC DEBT, INVESTMENT AND ECONOMIC GROWTH IN BANGLADESH

Specifically in Bangladesh, the main sources of domestic debt are (i) Bangladesh Bank (BB), (ii) deposit money banks (DMBs), and (iii) non-banks including National Savings Directorate (NSD). And most of the external loans received are through the concessional window of IDA, ADB and Japan (Islam, 2007).

Total public debt of Bangladesh government has accumulated over time because of persistent fiscal deficit along with widening trade deficit and savingsinvestment gap (Islam, 2007). In the recent past, the large increase in public debt was due to the priority of the current government to make Bangladesh a middleincome country by the year 2021, in line with the vision 2021 objective.

This study aims at exploring whether public debt has a direct impact on economic growth in Bangladesh. Furthermore, as investment is the basic channel through which public debt affects growth, it becomes very important to know the indirect influence of public debt on growth through its impact on investment channel. In the paper, following an introductory section, section II of the paper describes the findings of the related literature review. The section III analyses the trends in public debt and economic growth. The section IV and V deal with the research objective, models specification, sample size and sources of data and definitions of the related variables. A sub-section of the section V presents the estimations and interpretations of the results. The final section summarizes the findings and concludes the study.

2 II.

3 Review of Literature

A large body of literature on public debt is available in the international research studies which focuses on different issues of debt like its impact on economic growth, effect on investment, debt sustainability etc. However, the issue of public debt and economic growth is not very much focused in the context of Bangladesh.

To assess the impact of government debt on economic growth for 9 Latin American countries over a period of 12 years (1974-1986), Geiger (1990) used the lag distributional model and found a statistically significant inverse relationship between debt burden and economic growth. While analyzing 13 developing countries for a period of 1960-1981 and 1982-1989, Warner (1992) could not find any conclusive evidence whether debt has any negative effect on economic growth or it may have depressed investment in those developing countries.

An econometric study conducted by Abbas and Christensen (2007) to investigate optimal domestic debt levels in low-income countries (including 40 sub-Saharan Africa countries) and emerging markets between 1975 and 2004 and found that moderate levels of domestic debt as a percentage of GDP have significant positive effects on economic growth. Muhdi and Sasaki (2009) examined the macroeconomic effects of external and domestic debt in Indonesia by applying Ordinary Least Square (OLS) estimation for the period 1991 to 2006. The study found the positive effects of the rising trend of external debt on both investment and economic growth. Ogunmuyiwa (2011) investigated the relationship between external debt and economic growth in developing countries using Nigeria as a case study. Time series data from 1970-2007 were fitted into the regression equation employing various econometric techniques such as Augmented Dickey Fuller (ADF) test, Granger causality test, Johansen co-integration test and Vector Error Correction Method (VECM). His study reveals that causality does not exist between external debt and economic growth as causation between debt and growth was also found to be weak and insignificant in Nigeria. Chowdhury (1994) attempted to resolve the controversy of cause and effect relationship between external debt and economic growth, by conducting Granger causality tests for Asian and Pacific countries over a period of 1970-1988. He found that both public and private external debts have a relatively very small impact on GNP and both have opposite signs. Additionally, he found that any increase in GNP leads to a higher level of external debt, but overall external debt does not have any negative impact on economic growth. Schclarek (2004) investigated a sample of 59 developing countries and 24 industrial economies with data averaged over seven 5-year periods from 1970 to 2002 (such as 1970-74, 1975-79, 1980-84, etc.) to know the impact of debt on economic growth. The author did not find any linear or nonlinear relationship between gross government debt and economic growth in advanced economies. Empirical results also imply that higher public debt levels are not necessarily associated with lower growth rates.

Qureshi and Ali (2010) empirically explored the impact of high public debt burden on the economy of Pakistan. The sample of the study was 1981 to 2008. From their study a vast negative impact of public debt on the economy of Pakistan had been found by the authors.

The above mentioned studies show a mixed impact of public debt on economic growth. Some studies are of the view that public debt impedes the economic growth but some are of the opinion that public debt positively affects the economic growth.

4 III. Public Debt, Investment and Economic Growth in Bangladesh

To understand the behavior of public debt is important for considering its impact on investment and hence on growth. For this purpose, the researcher looks at the trends of growth of GDP, investment and public debt since independence (1974 to 2014) of Bangladesh.

Hassan and Akhter (2012) analyzed the effect of public debt burden on the economic growth of Bangladesh. The sample period was 1980-2011 and the authors used various econometric techniques such as Augmented Dickey-

Fuller (ADF) test, Johansen cointegration test, Error Correction Model (ECM) and Vector Error Correction Model (VECM). Empirical results reveal that there is no significant negative relationship between external debt and economic growth. They also found domestic debt has a negative impact on growth with little statistical significance.

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6 Source: (1) External Relation Division (ERD), Ministry of Finance; (2) Economic Trends, Bangladesh Bank; (3) World Development Indicator (WDI), World Bank; (4) National Savings Directorate (NSD).

Table-1 portrays the data on nominal value of Gross Domestic Product (GDPmp), Public debt and investment for the period from 1974 to 2014. Total outstanding public debt of Bangladesh increased more than 82 times between 1974-1979 and 2014. Over the period 1974 to 2014, the nominal value of public debt grew at the rate of 10 percent per annum. Total public debt as a percent of GDP in Bangladesh, on average, rose sharply from 33 percent during the 1970s to nearly 52 percent in the 2000s and came down to 35 percent in 2014. The rate of investment as a percent of GDP has sharply risen to percent, on average, during 2010-2014 from 10 percent in the 1975.

Another important matter is to study the trend in growth rates of public debt, GDP and investment to understand the relationship of public debt with investment and growth. It can be inferred from the Figure 1 that the overall public debt position has somehow impacted the growth rate of the economy of Bangladesh. As a percent of GDP, investment rate stood 28.7 percent in 2014 whereas it was, on average, 10 percent during the entire period of 1974-1980. In the long run there would be a limit to growth of investment as debt amount rises. The relative growths of public debt and GDP during the years 1989 to 2014 were about 9 and 12 percent per annum respectively.

7 Year

8 Correlation and R 2 comparison

The value of R 2 or coefficient of determination determines the explanatory power of the level of public debt which is used as independent variables in the regression models. The closer the value is to 1, the higher is the explanatory power of the specific measure for the variable on the Y-axis. The following table demonstrates R 2 and correlation between each combination of the variables. Table 2 displays that the variables considered in this study are positively and highly correlated with each other. This consistency to this statement is due to the fact that the correlation between DEBT and GDP and between DEBT and Investment is 0.99 and 0.98 respectively. And regarding the R 2 the regression models are well fit in the sense that explanatory variables in the models explain 72 and 51 percent variability of the dependent variable GDP, investment respectively.

9 IV.

10 Research Objective and Sample

The objective of this research is triple. Firstly, analyze the trend and patterns in public debt, and its relationship with investment and growth in Bangladesh. Secondly, observe the direct relationship between public debt and economic growth. Thirdly, observe the potential influence of public debt on investment; and therefore examine the indirect influence of public debt on economic growth through its impact on investment. For these purposes time series econometric tools have Public debt is an amount of money owed by the government to institutions, government agencies and other bodies either resident in or outside a country (Hassan & Akhter, 2012). Main sources of data on public debt (PD) are from Bangladesh Bank (BB) and Economic Relation Division (Ministry of Finance). Gross capital formation (formerly gross domestic investment) used as proxy of investment (INV), Export and import used as proxy of openness (OP) to international trade, and Gross secondary school enrolment rate used as human capital (HC) data are derived from World Development Indicators (WDI) of World Bank. Remittance inflow (REM) refers to transfer of money to the home county by its citizens working abroad. Data for remittance inflow has been collected from Bangladesh Bank (BB). Real interest rate (RI) is the lending interest rate adjusted for inflation as measured by GDP deflator. Data on population growth rate (PG) and M (Board money) were drawn from Bangladesh Economic Review. Total debt service (TDS) is the sum of principal repayments and interest paid on external loan. Data for GDP at market price and real interest rate were drawn from World Bank. Since the paper uses time series data, unit root tests have been performed in order to check the stationarity of the variables.

11 b) Model Specification

In order to perform an in-depth analysis of the debt-investment-growth relationship, the researcher tries to disentangle the debt-growth nexus in a two-step relationship. In the first step direct link between public debt and investment is examined and in the second step usual growth equation is estimated. The rationale of this specification lies in the expected positive effect that the level of public debt, openness to international trade, remittance inflow, money supply and the level of GDP have on investment decisions. The interest rate is expected to have a negative impact [Barro & Sala-i-Martin (2003); Cohen (1993)].

12 2) Model of Public debt, Investment and Growth

Following Mankiw, Romer, and Weil (1992), a paper on "A contribution to the Empirics of Economic Growth", the standard growth model is augmented with variables like public debt, remittance inflow to assess the impact of public debt on growth. The data used in the paper are annual time series available for 41 years to estimate the models. The structure of the models indicates that there is a possibility of endogeneity where some of the righthand side variables may be correlated with disturbances. If this is so, the OLS estimation provides biased and inconsistent result. The standard approach in such cases is to estimate the models using instrumental variable regression. So, the two-stage least square (TSLS) method has been used to estimate the instrument variable estimators. In this context, statistical software EViews 7 has been used for estimation purposes.

13 c) ADF Unit Root Test

Regression analysis based on time series data implicitly assumes that the underlying time series are stationary (Gujarati, 1995). So, test for stationarity of data is very important because of the possibility of spurious regression. A random time series Y_t is said to be stationary if its mean and variance are constant over time and the value of covariance between two time periods depends only on the distance between the two time periods and not on the actual time at which the variance is computed (Gujarati, 1995). Augmented Dickey-Fuller (ADF) unit root test has been used to check whether the variables are non-stationary by taking null hypothesis as 'there is unit root' against the alternative hypothesis 'there is no unit root'. The decision rule here is if the p-value from ADF test < 0.05 then the null hypothesis will be rejected. Otherwise, the null hypothesis will not be rejected. The results of the ADF for all the variables in their levels and first differences are reported in Table 3.

Reported ADF test indicates that none of the variables represents a stationary process in level form but they are stationary in the first differences which is statistically significant at 5% level of significance. So, the variables are integrated of order one, i. e. $I(1)$.

14 d) Regression Results

Finally, the regression results of the investment model and growth model are reported in table 4 and 5 respectively. Table 4 above shows the estimates of equation 1 where public debt is associated with total investment. The most important result of the econometric estimates is the positive relationship between public debt and investment, which is statistically significant at less than 8 percent level. This type of result is also supported by the previous study done by Hassan and Akhter (2012). The government of Bangladesh is historically found to run deficit budgets. A large portion of the public debt is invested in the public sector that increases the amount of total investment. So, increase in investment is positively related to public debt.

With respect to the other individual coefficients, GDP and remittance inflow have shown the expected positive significant relationship with the investment. The coefficients of openness to international trade and real interest rate are as expected, but are insignificant and thus no definite conclusion can be drawn regarding their association with public debt. However, the coefficient of money supply is negative (-0.205553) and, of course, statistically insignificant. The overall goodness of fit of the model is satisfactory, as over half of the variation in total investment is explained by the model. Durbin-Watson statistics, however, is close to 2, indicating no autocorrelation. The most important result of the econometric estimates is the positive relationship between public debt and economic growth, which is statistically significant at less than 1 percent level. A significant amount of public debt in Bangladesh is invested in public sector to develop the infrastructure like roads and highways; electricity, gas and water supply etc. Bangladesh has been facing infrastructural bottlenecks since its independence. Investment in the development of infrastructure promotes private entrepreneurs to invest more in the country. This may cause positive relationship between public debt and economic growth in Bangladesh.

With respect to the other individual coefficients, the total investment and openness to international trade indicators are positive and highly significant, as in Barro (1991), Pattillo et al. (2002) and Abbas (2007). The other controlling variables such as remittance inflow, gross enrolment rate and population growth rate supported the expected outcomes while the coefficients remain insignificant. The overall goodness of fit of the model is satisfactory, as 73 percent of the variation in economic growth is explained by the model. Durbin-Watson statistics, however, is close to 2, indicating no autocorrelation.

In the table 4 it is evident that, public debt appears to enhance the level of investment, and the econometric estimates in this section (Table 5) verify that a positive relationship exists between investment and economic growth. Thus, an increase in the level of public debt, *ceteris paribus*, would appear to induce the level of

investment over time and this, in turn, is likely to enhance economic growth indirectly. So, the empirical estimates indicate that public debt enhances economic growth through its beneficial impact on investment.

VI.

Conclusion

Public debt is one of the major sources of financing for development projects in Bangladesh. As a result of persistent fiscal deficit along with widening trade deficit and savings-investment gap, total public debt in Bangladesh has accumulated over time. In this study the objective was to examine the relationship between public debt and economic growth in Bangladesh. The empirical findings of the study indicate that public debt has made a significant contribution to economic growth, as measured by GDP, not only directly but also indirectly via its effect on investment because the public debt, *ceteris paribus*, would appear to induce investment over time and this, in turn, indirectly enhance economic growth. The calculations from the regression results reveal that public debt positively affects growth, provided other determinants of growth remain unchanged. On average, 1 percent increase in public debt is associated with an increase in GDP of around 0.2 percent per annum. From the study, it appears that the resources generated through public debt are basically used for productive investment in Bangladesh.



Figure 1: VolumeB

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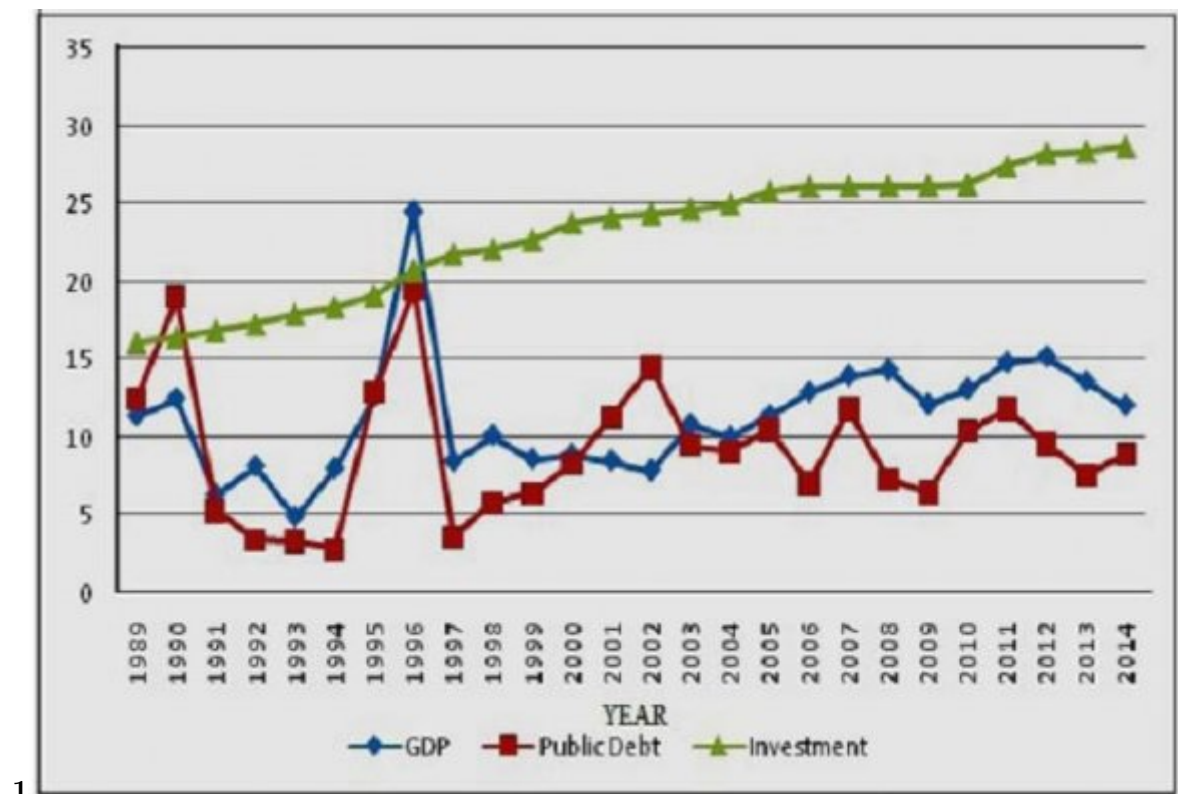


Figure 2: Figure 1 :

1

Figure 3: Table 1 :

2

Variable	Public Debt Correlation	R-square
GDP	0.99	0.73
Investment	0.98	0.51

Source: Author's calculation using EViews 7

Figure 4: Table 2 :

3

Variable	ADF test statistic	p-value	5% critical value	10% critical value	Decision
Log(Y)	-1.34	0.60	-2.94	2.61	Non-Stationary
? log(Y)	-11.52	0.000	-2.94	2.61	Stationary
log(INV)	-1.44	0.55	-2.94	-2.61	Non-Stationary
?log(INV)	-3.96	0.004	-2.94	-2.61	Stationary
log(PD)	-2.60	0.067	-2.94	-2.61	Non-Stationary
?log(PD)	-5.68	0.000	-2.94	-2.61	Stationary
log(OP)	-1.05	0.72	2.94	-2.61	Non-Stationary
?log(OP)	-7.96	0.00	-2.94	-2.61	Stationary
HC	0.63	0.98	-2.99	-2.64	Non-Stationary
?HC	-3.06	0.040	-2.99	-2.64	Stationary
PG	-0.15	0.93	-2.94	-2.61	Non-Stationary
?PG	-16.38	0.000	-2.94	-2.61	Stationary
RI	-3.18	0.055	-3.52	3.20	Non-Stationary
?RI	-6.22	0.000	-3.52	-3.20	Stationary
log(M)	-0.36	0.90	-2.94	-2.61	Non-Stationary
?log(M)	-4.45	0.001	-2.94	-2.61	Stationary
log(REM)	-2.40	0.15	-2.94	-2.61	Non-Stationary
?log(REM)	-5.19	0.000	-2.94	-2.61	Stationary
log(TDS)	-1.55	0.49	-2.94	-2.61	Non-Stationary
?log(TDS)	-4.77	0.000	-2.94	-2.61	Stationary

Note: ? means first difference

[Note: Y]

Figure 5: Table 3 :

4

Dependent Variable: Log(INV)

Method: Two-Stage Least Squares

Instrument specification: C Log[PD(-1)] Log(Y) Log(M) RI Log(REM)

Log(TDS) Log(OP)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.022790	0.036996	0.616025	0.5424
Log(PD)	0.074628	0.250563	0.297840	0.0768
Log(Y)	1.040314	0.286623	3.629551	0.0010
Log(OP)	0.023453	0.106972	0.219246	0.8279
RI	-0.001344	0.001394	-0.963695	0.3427
Log(REM)	0.131311	0.043089	3.047396	0.0047
Log(M)	-0.205553	0.192747	-1.066440	0.2945
R-squared	0.514777	Adjusted R-squared		0.420862
F-statistic	6.282405	Durbin-Watson stat		1.682514
Prob(F-statistic)	0.000211			

Figure 6: Table 4 :

5

Dependent Variable: Log(GDP)				
Method: Two-Stage Least Squares				
Instrument specification: Log[PD(-1)] Log[INV(-1)] Log(PD) Log(OP) HC				
PG Log(REM) Log(TDS) Log(M) RI				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.039591	0.016318	2.426270	0.0239
Log(PD)	0.199720	0.061749	3.234351	0.0038
Log(INV)	0.356328	0.110076	3.237098	0.0038
Log(OP)	0.158300	0.055346	2.860183	0.0091
HC	0.001404	0.002992	0.469170	0.6436
PG	0.090172	0.120031	0.751240	0.4605
Log(REM)	0.041241	0.028340	1.455256	0.1597
R-squared	0.726995	Adjusted R-squared		0.640130
F-statistic	7.615929	Durbin-Watson stat		1.899421
Prob(F-statistic)	0.000106			

Figure 7: Table 5 :

5

Figure 8: Table 5

229 [BB: Economic Trend] , *BB: Economic Trend*

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