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Private Investment and Economic Growth in Bangladesh: An Empirical Investigation

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Abstract: There is a widespread view that private investment is generally more efficient and productive than public investment. There has been no systematic testing of this hypothesis in case of Bangladesh. In the absence of any empirical evidence it is very difficult to argue that promotion of private sector initiatives and reduction in the role of the public sector in the area of investment would necessarily be beneficial to the overall growth of the economy of Bangladesh. The objective of this paper was to develop a simple growth model that allowed private and public sector investment to exert differential effects on GDP growth. The main finding of the study is that the private investment plays a much larger, and thus more important role in the growth process of Bangladesh.

Key words: Private investment, economic growth, and stationary test

Introduction

As a least development country, the economy of Bangladesh is characterised by dominance of agriculture, absence of raw materials, low investment, over reliance on foreign assistance, low growth rate, heavy reliance on import of manufactured goods. The economic difficulties facing by Bangladesh are widening current account and balance of payments deficits, growing foreign debts burden, shortage of savings and investment have led to fundamental examination of adjustment and development strategies. Specifically, in the profession and in policy making circles has shifted against large-scale government intervention and toward greater reliance on the market in allocation and use of resources (Khan and Reinhart, 1990). Thus, market-based reforms are now considered part and parcel of what has come to be known as growth -oriented adjustment (Corbo *et al.,* 1987).

In the growth models that relate the rate of growth of output to the rate of capital formation, among other factors such as labour force growth, imported inputs, and technical progress, make no distinction between the private and public component of investment (Khan and Reinhart, 1990). It is, therefore, not possible to determine if policies designed to encourage private investment at the expense of public investment will necessarily help the growth rate. They well might if investment undertaken by the private sector is more efficient and productive, but that judgement has to be based on empirical evidence. Interestingly, in case of Bangladesh, there is no empirical evidence that can be called on to support or disprove the notion that private investment is some sense "better" than public investment.

The purpose of this paper is to shed some light on this important issue by formulating a simple growth model that separates the effects of public sector investment. The estimates of the parameters provide a quantitative picture of the respective roles of public and private investment in the growth process of Bangladesh.

Data and the Related Issues: The study is based on secondary data. The paper employs annual data over the period 1980-81 to 2000 -2001 at constant price. In the analysis we have used the data of Private investment (I^p); Public investment (I^g); Total investment (I^t), Export; Import and GDP. All data are collected from National Accounts Statistics of Bangladesh published by Bangladesh Bureau of Statistic (BBS). The Ljung-Box (LB) test statistic has been used to correct for serial correlation and Unit Root test for stationary characteristic of the variables.

Stationary Test: Stationary of a time series data is very important as the use of a non-stationary time series data in regression analysis can give rise to dubious and spurious relationship. Data series (Y) can be either
(i) Trend stationary if $\hat{Y}=\alpha+\beta_t$ then $e=Y-\hat{Y}$ is stationary;
(ii). Difference stationary; and/or (iii). The series may be de-trended and differenced so as to obtain a stationary series (Enders, 1995).

Both Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) test is applied for testing the stationary characteristic of the data sets.

The Dickey-Fuller and Augmented Dickey-Fuller Test: Let ΔY is the first differences of data set (Y) and then estimation of DF test is as follows:

$$\Delta Y_t = \alpha_o + \beta_1 Y_{t-1} + \mu \qquad (1)$$

If the error term (μ) is autocorrelated the following modified Augmented Dickey-Fuller (ADF) test is employed.

$$\Delta Y_t = \beta_o + \sum_{i=1}^{p} \beta_i \Delta Y_{t-1} + \mu_1 \qquad (2)$$

Where p is the suitable chosen lag length.
The following procedure was used when estimating equation (1) and (2). We first estimated equation (1) and employed the LB test (as explained next), to test the error term (μ) for stationary. If the error term was found to be a white noise process then the DF test statistic is considered to be the appropriate test statistic. If, however, the error term is not a white noise process then we proceed to include a lag as in equation (2).

The Ljung-Box Test: This test is a variant of Box-Pierce Q statistic and tests the joint hypotheses that all the autocorrelation coefficient (ρk) is simultaneously equal to zero. The Ljung-Box (LB) statistic is defined as:

$$LB = [n(n+2)][\sum \frac{\rho_k^2}{(n-k)}] \approx X_m^2 \qquad (3)$$

Where n = sample size and m = lag length.
The LB statistic follows a x^2 (m) distribution and hence if the computed LB statistic exceeds the critical value for a given level of significance, one can reject the null hypothesis that all (ρ_k) are zero. In large samples both the Box-Pierce Q statistic and the LB statistic follow the x^2 distribution with m degree of freedom. However, the LB statistic has found to be more powerful in small samples (Gujarati, 1999).

Specification of The Models: Most of the growth models specified for developing countries trace roots back to the neo-classical framework of Slow (1956). This framework takes as it is starting point an aggregate production function relating output to factor inputs and a variable usually refereed to as total factor productivity:

$$Y = Af(K_t, L_t, Z_t) \qquad (4)$$

Where y is the level of out (GDP), K is the stock of physical capital, L is the labour force, and Z is a vector including other factors affecting growth.
Expressing equation (4) in growth terms and for estimation purpose, we can rewrite the equation as follows:

$$\frac{\Delta y}{y_{-1}} = \beta_o + \beta_1 \frac{I}{Y_{-1}} + \beta_2 \frac{\Delta L}{L_{-1}} + \beta_3 \frac{\Delta Z}{Z_{-1}} + \mu_1 \qquad (5)$$

Where I/Y-1 representing the ratio of investment to GDP and α_1 the marginal productivity of capital. The coefficients α_2 and α_3 are the output elasticity of labour and of the other factors Z respectively
The general specification of equation (5) is the standard growth model used in a significant portion of the empirical literature.
While the first two variables in equation 5 are standard inclusions in the empirical literature, the Z vector has included a long list of additional variables such as openness of the economy, import, export, interest rate of external debts, government expenditure and consumption, saving rate, and government expenditure on primary and secondary education. In order to test whether private sector investment and public sector investment have differential impacts on the growth rate, we can split these up and rewrite equation (5) as:

$$\frac{\Delta y}{y_{-1}} = \beta_o + \beta_1 \frac{I^p}{Y_{-1}} + \beta_2 \frac{I^g}{Y_{-1}} + \beta_3 \frac{\Delta L}{L_{-1}} + \beta_4 \frac{\Delta Z}{Z_{-1}} + \mu_1 \qquad (6)$$

Where I^p is private sector investment and I^g is public sector investment, $I^p + I^g = I$
If the effects on growth of private and public investment were the same, this would be imply that the respective marginal productivities are equal, $\beta_1 = \beta_2$.
On the other hand, if private investment is more efficient and productive at the margin than is public sector investment, than we would expect that $\beta_1 > \beta_2$.
As our concern is solely with the investment growth relationship, we chose to be indifferent about the fourth

determinant of growth. However, like any other developing countries, the international trade of Bangladesh is also heavily depended on imports of capital and intermediaries goods as inputs into production process and limited number of export of manufactured commodities. For capturing the joint effect International trade on growth, the Z variables could be the degree of openness of the economy of Bangladesh. Thus for our practical purpose equation (6) will be as:

$$\frac{\triangle y}{y_{-1}} = \lambda_0 + \lambda_1 \frac{I^p}{Y_{-1}} + \lambda_2 \frac{I^g}{Y_{-1}} + \lambda_3 \frac{\triangle L}{L_{-1}} + \lambda_4 \frac{\triangle D}{D_{-1}} + \mu_2 \qquad (7)$$

Where D is degree of openness of Bangladesh economy

Empirical Findings

Results of the Unit Root Test: In this section we analyse the result of Unit Root test. Computed LB statistic (equation 3 above) for all the variables along with their ACF value, standard error, X^2 value and probability are presented in Table 1.

Table 1:Result of the ADF test

Variables	Lag	ACF	Stand.Err.	LB	X^2_m	Prob.
Growth of GDP	5	0.01	0.193	0.81	1.15	0.976
Invest.(T) to GDP	2	0.02	0.223	0.002	0.10	0.963
Invest.(P) to GDP	2	0.011	0.223	0.002	0.10	0.961
Invest.(G) to GDP	2	-0.02	0.223	0.008	0.10	0.928
Gr.Degr. of Open.	2	-0.023	0.223	0.01	0.10	0.919
Gr. of Labour Force	5	0.094	0.193	1.09	1.15	0.995

From the table 1 it is evident that the computed LB statistic for all the variables is lower than the critical value of X^2 at 5% level. It indicates that the errors for all the variables at this level are white noise. Therefore, we can accept the null hypothesis that all autocorrelation coefficient (ρ_k) are simultaneously equal to zero. Based on the LB statistic, our overall conclusion is that all of our time series variables are stationary.

OLS Results of the Growth Model: Table 2 represents the estimated results for the growth equations. Equation 1 was estimated to provide a benchmark against which we compare our results when investment is disaggregated into its private and public components. Considering the results in which growth of total investment to GDP ratio is considered as an explanatory variable along with growth of labour force, where degree of openness is the third factor in the growth model. It is evident from the result (Table 2, Row -1), that the coefficient of total investment has the correct sign and significance at 10% level. The coefficient of growth of labour force is positive but statistically insignificance. More importantly, the marginal productivity of degree of openness indicates a negative co-efficient. However, as the estimated co-efficient is not statistically significant, we cannot make too much of

Table 2: Results for growth models

Eq.	Constant	Investment			Growth of Labour	Degree of Openness	R^2	DW	F	SEE
		Total	Private	Public						
1	.02	.59**			.29	-.24	.25	2.71	1.79	.02
	(.30)	(1.94)			(.18)	(-1.24)				
2	.05									
	(.66)		.89**		1.43	-.21	.21	2.78	1.43	.02
			(1.66)		(.70)	(1.03)				
3	.04									
	(.66)			.52**	-.89	-.03	.15	2.74	.94	.02
				(1.19)	(.49)	(-.22)				
4	.04									
	(.54)		.83	.44	.91	-.29	.27	2.75	1.36	.02
			(1.53)	(1.06)	(.44)	(-1.32)				

Figures in the parentheses indicates coefficient of T values

** Indicates significant at 10% level.

SEE is the standard error of the estimated equation

the sign of this co-efficient. At best all we can say that degree of openness has no direct effects on growth of Bangladesh economy.

In order to analyse the individual effect of public and private investment on growth; we estimated equations 2 and 3. In equation 2, where public investment consider as an explanatory variable instead of total investment (row -2), the estimated coefficient of investment variable decrease in size and become insignificant. The coefficient of labour force variable turns out to be negative. The explanatory power of the equation also decreased.

While, public investment is replaced by private investment (row-3), the coefficient of investment variable is increases in size with expected positive sign and is significance at 10% level. It implies that private investment seems to have most important impact on economic growth of Bangladesh.

In equation 4, we run together the two investment variable ie. Private and public investment in the growth model. The results (row-4) show that the coefficient of investment variable has the correct sign. The coefficient of private investment remains significant at 10% level. While the same in case of public investment is insignificant. The marginal productivity of private investment is much higher than that of public investment ie. $\beta_1 > \beta_2$.

In summary, the results in table 1 demonstrate that private investment plays a dominant role in growth of Bangladesh relative to (a) total investment and (b) public investment.

Data Appendix

		Investment					
Year	GDP	Total	Private	Public	Export	Import	Population
1980-81	923597	118254	87696	30558	57409	127450	89.9
82	945547	127836	96390	31446	54851	139436	91.6
83	983520	134316	99305	35011	59917	133653	93.5
84	1034473	147147	110283	36864	59350	125008	95.5
85	1067818	156014	116513	39501	64039	134061	97.5
86	1113185	166411	119752	46659	63303	128486	99.4
87	1154732	179980	123356	56624	64506	135811	101.5
88	1179833	190923	124877	66046	71398	145988	103.4
89	1210479	204306	123011	81295	77750	167955	105.5
1990	1282400	217235	126450	90785	91579	183596	108.7
91	1325224	220312	134125	86187	88748	156025	111
92	1392004	230096	137573	92523	108135	142309	113.3
93	1455680	252011	160534	91477	125862	195560	115.5
94	1515140	275582	174779	100803	130491	183609	117.7
95	1589761	300673	194365	106308	170584	272469	119.9
96	1663240	332535	225803	106732	184359	310913	122.1
97	1752847	369394	243179	126215	214832	305518	124.3
98	1744478	413951	291164	122787	241172	306042	126.5
99	1934291	454894	315989	138905	255632	321259	128.2
2000	2049276	488003	328194	159809	282106	359959	129.9
2000-01	2157353	516163	351358	164805	329031	426119	131.6

Conclusion

The main conclusion of this study is that private investment and public investment do appear to have different effect on the long-run economic growth of Bangladesh. In other words, the marginal productivity of private and public investment is differing in Bangladesh. Further private investment plays a much larger, and thus more important role in the growth process f Bangladesh economy than does public investment. We find that at best public investment has no statistically significant effect on the growth process. We, therefore, could, say that the proposition that private investment should be favoured in development strategies has some empirical support.

Considering only the direct effect of private and public investment that we have addressed in this paper, the policy implications are straightforward. Government should aim at creating conditions, which make private investment attractive.

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