Testing Investment led Income Growth in Bangladesh. An Empirical Investigation

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Abstract

The study empirically examines the impact of investment on the per capita income growth in Bangladesh within the period of 1980 to 2018. The paper also tries to explore the causal effects of total debt to investment and per capita income and inflation to per capita income in Bangladesh. This research uses Joahansen Juselius co integration method to establish the long run relationship among the variables. The study also employs Toda-Yamamoto augmented Granger causality test to find the direction of causality among the variables. The results of Joahansen Juselius co integration test confirm long run relationship among capita income, investment, total debt and inflation. According to the causality test results, there exist no causal effects from investment and inflation to per capita income growth in Bangladesh. Moreover, the results also revealed that the escalating total debt has no positive impact on investment and per capita income in Bangladesh. The study, therefore, recommends some policy reforms particularly on the ground to accelerate investment specifically on the productive sector and to pay high concentration on the efficient debt management.

Key words: Per Capita Income, Investment, Bound Test, Co integration, Causality

JEL Classification: C22, C87, E22, E25 H63

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1. Introduction

The importance of inclusive and consistent income growth has significantly been prioritized in many theoretical and empirical literatures and also in the strategies of Sustainable Development Goals (SDGs). Due to the growing problems of income inequality, poverty and hunger in the lower developing countries, the issue of sustainable and equitable income growth has now become a leading development agenda in the so called development programs such as MDGs and SDGs. However, in Bangladesh, the income growth is increasing. Recently, the country have achieved the status of lower middle income country and also targeting to be a middle income country by 2021 and to be in line of rich country by 2041. Hence, Bangladesh needs to emphasize on the quality of income growth. The increase in total investment in the country literally would strengthen the quality of income growth as it will create employment opportunities to even the remote areas in the country. In this backdrop, the main objective of this study is to empirically appraise whether the growth of per capita income in Bangladesh is investment oriented or not.

Now, what is the rationale behind this study? The answer generally explains the following two reasons. First, despite investment growth is a leading factor to measure the quality of income growth, the statistics shows that the investment proceeds slowly compare to the income growth in Bangladesh. As stated by Raihan (2016) that Bangladesh stands on the worst position among all middle income countries in the field of public investment growth which is a solid sector to contribute to health and education. Hence, the paper has intended to find out the causality running from investment to income growth in Bangladesh. Second, theoretically, some key macroeconomic variables such total debt, inflow of remittances, foreign direct investment, disbursement of bank credit and inflation rate can put a serious effect on the performance of investment growth. On the contrary, the mismanagement of remittances and foreign direct investment can impede productivity growth. Likewise, the inefficient uses of debt and inflation rate are also more destructive for the economy as debt has to be repaid with interest and inflated price level slowed down productivity growth by raising interest rate. The work of Chisty, et al. (2015), however, in this case can be sited as an example. They showed some significant impact of inflation on the variation of per capita income in the economy of China and Russia. Furthermore, Ilyas, et al. (2014) have also found some positive impact of inflation and negative impact of deflation on the economic growth of Pakistan.

In this backdrop, the main objective of this paper is to empirically examine the effects of investment to per capita income in Bangladesh. Furthermore, the paper is also tried to find the causal effects of total debt and inflation on the investment and per capita income. The paper has incorporated total debt and inflation because of their significance on the influence of investment and per capita income in Bangladesh. For example, compared to other key variables, total debt is increasing rapidly. Hence, total debt should be utilized properly to put some positive impacts on investment and per capita income. Consequently, the inflation, as evident in many theoretical and empirical works, has also some significant effects on investment. The contemporary economic theory says that the increase in inflation raises the general rate of interest and thereby slowed down investment demand. Moreover, the Fisher effect also draws a positive relationship between inflation rate and nominal interest rate. Furthermore, it is important to note that due to deflationary effect, the real per capita income can be healthier in the short run in such a stagnant investment performance in Bangladesh.

However, the present study uses Johansen Juselius co integration approach to test the long run relationship among Per Capita Income (PCI), Total Investment (TI), Consumer price Index (CPI) which is used as a proxy variable of inflation Total Debt (TD). Furthermore, Toda-Yamamoto Augmented Granger Causality test is employed to find the direction of causality among the variables.

The rest of the paper is structured as follows. Section 2 reviews both empirical and theoretical literature on the relevant issues after the introduction in section 1. Section 3 provides theoretical framework while section 4 describes data and methodology of the study. The empirical results are stated in section 5 and the paper concludes with some policy recommendations in section 6.

2. Literature Review

Income is an important determinant to measure the standard of living of the people. The aggregation of income, however, by many classical and contemporary economic theories depends on investment. While acceleration of investment has positive impact on income, as stated by contemporary economic theory, raising the general price level impacts adversely on income by lowering the purchasing power. Hence, in the literature review, the paper highlights separately on the works on investment income growth and inflation income growth relationship. Moreover, as debt is a significant source of development fund in Bangladesh, the paper also explores debt income literatures.

2.1. Investment and Income growth Relationship

The theoretical and empirical literature focusing on the relationship between investment, income and economic growth is plenty around the globe. However, it is necessary to mention here that, for Bangladesh, especially the relationship between investment and income growth is quite nascent. Fagbohun et al (2016) has investigated the effects of investment on long run per capita income growth in Nigeria for the period of 1970 to 2014. They employed the Ordinary Least Square (OLS) and concluded that investment and other macroeconomic determinants dictate the movement of per capita income in Nigeria. Adetiloye and Adeyemo (2012) also explored the impact of investment on per capita GDP in Nigeria. He found that the rate of investment does not assist the rate of growth of per capita in Nigeria. Hasan and Murtala (2016) have examined the phenomena of per capita income convergence across a panel of ASEAN-5 economies. They also investigated the effects of public and private investment on per capita income convergence among the countries. By using GMM estimation, they found that domestic investment plays a significant role in augmenting per capita income in ASEAN-5 countries. They concluded that government in ASEAN-5 countries should strengthen the existing investment related policies and should create the new incentive based policies that facilitate per capita income convergence among the above countries. Churchil, et al (2015) explored the impact of government expenditure on the per capita income based on 87 empirical studies. By using a hierarchical meta-regression analysis, they found negative association between government expenditure and per capita income. Similarly, Makuyana and Odhiambo(2016) have reviewed theoretical and empirical research to explore the impacts of public and private investment on economic growth in both developed and developing countries. They have concluded that public investment is important in developed countries particularly to improve the infrastructure that will stimulate the private investment and economic growth. In developing countries, they argued both public and private investment have positive impact on the economy. Hasan and Murtala(2016) and Abulrahman (2015) has investigated the empirical relationship between investment and economic growth for Sudan economy and identified positive impact of investment growth on the economic growth.

For Bangladesh economy, investment and per capita income growth have been widely used in many empirical researches. It has been found that the investment is studied over economic growth whereas per capita income is subjected with many variables like FDI, trade, money supply, good governance etc. For example, Uddin and Aziz (2014) have examined the effects of public investment on economic growth in Bangladesh during the time period of 1973 to 2011 and found positive impacts of public investment on economic growth. Hussain and Haque (2016) have used Vector Error Correction Model (VECM) to show the relationship between Foreign Direct Investment (FDI), trade and growth rate of per capita GDP in Bangladesh for the time period of 1973 to 2014. They found significant effects of FDI and trade on growth rate of per capita GDP in Bangladesh.

2.2. Inflation and Per Capita Income Relationship

Alshamsi et al (2017) have investigated the impact of inflation rate and per capita GDP on FDI inflow for United Arab Emirates for the period of 1908 to 2013. They concluded that inflation has no significant impact on FDI and they also found a positive impact of per capita GDP on FDI in United Arab Emirates. Cooray (2013) estimated that up to 11% of inflation rate, growth has positive relationship with inflation after that level growth drops down if inflation continues to increase in Sri-Lanka. Chisty et al (2015) have investigated the impact of inflation on per capita income in BRICS countries. In their analysis,they found that inflation do not statistically influence the per capita income in the three countries like India, Brazil and South Africa, on the other hand, inflation do statistically influence per capita income for other two countries which are China and Russia. Another study conducted by Ilyas et al (2014) has found that inflation and real interest rate are negatively related with economic growth in Pakistan

However, in Bangladesh, most of the empirical research subjected inflation in relation with economic growth rather than per capita GDP. For example, Hossain, et al. (2012) have explored the long run relationship of inflation and economic growth in Bangladesh. They used VAR Granger causality method and found uni directional causality from inflation to economic growth. In a similar investigation, Majumder (2016) used Vector Error Correction Model (VECM) and found a positive correlation between inflation and economic growth in Bangladesh in the long run. Javed, et al (2015) have analyzed the comparisons of standard of living between Pakistan and Bangladesh with respect to some social and economic factors. Amongst many relationships, they, however, found that price level in the both the countries are negatively related with per capita income. Kamal (2016) has investigated long run causality between money income and price level in Bangladesh. By using time series econometric techniques, he found uni directional causality running from price to real GDP in Bangladesh.

2.3. Debt, Investment and Per Capita Income Relationship

Smrcka and Arltova (2014) have examined the effects of public sector debt on the people's standard of living in Czech Republic. In the case of subsidized sovereign debt, they noted that a part of debt did not raise the family income rather have been used for imports of goods and services. Jadoon, et al (2014), have studied the impacts of foreign debt service payment on the per capita income growth rate of Pakistan both in short-run and long run. They found that excessive debt service payment as a result of mounting debt sock has negative effect to the per capita income growth rate. In the similar investigation, Jacobo and Jalile (2017) have found highly statistically significant non-linear relationship between government debt and per capita GDP in 16 Latin American economies. Saad (2012) has explored the empirical relationship between external debt, export and economic growth for Lebanon over the time period 1970 to 2010. He employed vector error correction model and Granger causality test and found bi directional causal effects between external debt and economic growth.

Yesmin, et al (2016) found significant negative impact of debt on GDP growth rate in Bangladesh. They concluded that debt is a burden as it is not creating income generating activities in the country and hence is making GDP growth slowed down. On the other hand, Rahman, et al (2012) also identified positive impact of debt on the economic performance of Bangladesh. Islam and Faisal (2012) analyzed the sustainability of debt in Bangladesh and it future impact to the economy. They concluded that external debt costs heavily to Bangladesh people. They have expressed their concern in the paper as Bangladesh spends significant portion as debt service payment each year which ultimately hampering the health and education sector in particular.

3. Theoretical Framework

The role of investment in the process of economic development is significant in all the prominent growth theories like classical, neo classical and Keynesian theories of economic development. The classical growth theories developed by Adam Smith stressed on the investment which is determined by the increase in capital endowment per worker (k) and fraction of savings (s) for the higher economic growth. In the Ricardian doctrine, profit finances investment and the growth rate of capital stock determines the growth rate of national product (Chang, 2010).

According to the Keynesian growth theory, investment is inevitable to bring the additional effective demand through the multiplier mechanism (Chang, 2010, p. 18). The model explains the significance of investment on income and output growth by the name of income effect of investment and capacity effect of investment. The income effect of investment tells that more investment brings more income and profit whereas the capacity effect of investment explains that the higher output growth mainly depends on capital productivity and investment volume.

However, the paper also uses the concept of debt overhang theory developed by Myers (1977), Krugman (1988) and Cohen (1993).The theory explains the relationship of debt and income generation through the acceleration of investment growth. As stated by the theory, the debt should be transformed into productive investment which would increase income for the mass by creating employment opportunities and would be helpful for the debt retirement.

Hence, in accordance with the theoretical aspects, as stated above, investment is important for the acceleration of income growth. However, if debt is not utilized properly, as the debt overhang theory says, it will impact negatively on investment and thereby on the income generating activities. In this backdrop, the paper intends to examine the impact of investment, debt and inflation on the per capita income in Bangladesh.

4. Data and Methodology

4. 1. Data

The study is based on secondary data. The data of the study variables such as the Per Capita Income (PCI), Total Investment and Consumer Price Index (CPI) have been collected from World Economic Outlook (2019) and the data of Total Debt (TD) is taken from Ministry of Finance of Bangladesh and World Economic Outlook (2019). However, the data of inflation has proxied by data of Consumer Price Index (CPI). To investigate the relationship between the study variables, the paper uses time series data for the time period 1980 to 2018.

Table-1: Trends of Total Investment (TI), Per capita Income (PCI), Consumer Price Index (CPI) and Total Debt (TD) in Bangladesh

Year	TI (Percentage of GDP)	PCI (In US $)	CPI	TD (Percentage of GDP)
1980	13.34	-1.853	17.92	32.50
1985	17.38	262.55	27.8	37.02
1990	17.51	329.49	49.85	40.11
1995	20.44	383.10	63.73	51.80
2000	24.151	412.334	80.224	50.12
2005	26.063	495.486	102.691	42.296
2010	26.874	807.531	163.519	35.489
2015	29.295	1303.18	227.388	33.68
2018	31.599	1744.51	268.082	34.759

Source: 1) World Economic outlook (2019)

2) Bangladesh Economy: Recent Macroeconomic Trend, Ministry of Finance

4.2: Model Specification

4.2.1 Co Integration Test: Johansen Juselius Co Integrating Method.

Co integration among the time series variables refers to the existence of stable long run relationship. A number of econometric methodologies like two-step procedure of Engel and Granger (1987), Johansen Juselius Co integration technique are being widely used to empirically analyze the time series variables. However, in this study, the method developed by Johansen (1988, 1991) and Johansen and Juselius (1990) is applied to detect the number of co integrating vectors as the time series is large and also are integrated at same order. However, the following equation is estimated under the Johansen Co integration framework.

$$\Delta X_t = \mu + \Gamma\Delta X_{t-1} + \dots\dots\dots\dots \Gamma_{k-1}\Gamma\Delta X_{t-k+1} + \Pi X_{t-1} + \nu_t \qquad (1)$$

Where, Δ is the difference operator, X is the vector of variables, μ is a draft parameter and Γ_1 +............ Γ_{k-1} is the coefficient matrices. Moreover, according to the Johansen Juselius co integrating method, there are two test statistics like trace statistics and maximum eigen value test statistics to find the number of co integrating vectors.

$$\lambda_{trace} = T\sum_{i=r+1}^{N} ln(1-\lambda_i) \qquad (2)$$

$$\lambda_{max)} = -T\ln(1-\lambda_{r+1}) \qquad (3)$$

Here, T is the sample size and λ_i is the N-r smallest canonical association. The Trace and maximum Eigen value statistics test the null hypothesis that the number of co integrating vectors r against the alternative co integrating vectors r+1 respectively. In both tests, the rejection of null hypothesis (r=0) and acceptance of alternative hypothesis indicates that the time series are co integrated.

4.2.2: Toda-Yamamoto Augmented Granger Causality Test

In this paper, the Toda-Yamamoto augmented Granger causality test has been applied to determine the direction of causality among variables. The paper uses this method because it has some specific advantages regarding the pretesting of stationary and co integration test. The formulation of Toda-Yamamoto approach is basically based on the augmentation of VAR order k with d_{max}, where d_{max} is the maximum order of integration. The model can be specified as follows:

$$LNPCI_t = \beta_0 + \sum_{i=1}^{k} \beta_{1i} LNPCI_{t-i} + \sum_{j=k+1}^{k+dmax} \beta_{2j} LNPCI_{t--j} + \sum_{i=1}^{k} \beta_{3i} LNTI_{t-i} + \sum_{j=k+1}^{k+dmax} \beta_{4j} LNTI_{t-j} + \sum_{i=1}^{k} \beta_{5i} LNCPI_{t-i} + \sum_{j=k+1}^{k+dmax} \beta_{6j} LNCPI_{t--j} + \sum_{i=1}^{k} \beta_{7i} LNTD_{t-i} + \sum_{j=k+1}^{k+dmax} \beta_{8j} LNTD_{t-j} + \varepsilon_{1t} \tag{4}$$

$$LNTI_t = \alpha_0 + \sum_{i=1}^{k} \alpha_{1i} LNTI_{t-i} + \sum_{j=k+1}^{k+dmax} \alpha_{2j} LNTI_{t--j} + \sum_{i=1}^{k} \alpha_{3i} LNPCI_{t-i} + \sum_{j=k+1}^{k+dmax} \alpha_{4j} LNPCI_{t-j} + \sum_{i=1}^{k} \alpha_{5i} LNCPI_{t-i} + \sum_{j=k+1}^{k+dmax} \alpha_{6j} LNCPI_{t--j} + \sum_{i=1}^{k} \alpha_{7i} LNTD_{t-i} + \sum_{j=k+1}^{k+dmax} \alpha_{8j} LNTD_{t-j} + \varepsilon_{2t} \tag{5}$$

$$LNCPI_t = \lambda_0 + \sum_{i=1}^{k} \lambda_{1i} LNCPI_{t-i} + \sum_{j=k+1}^{k+dmax} \lambda_{2j} LNCPI_{t--j} + \sum_{i=1}^{k} \lambda_{3i} LNTI_{t-i} + \sum_{j=k+1}^{k+dmax} \lambda_{4j} LNTI_{t-j} + \sum_{i=1}^{k} \lambda_{5i} LNPCI_{t-i} + \sum_{j=k+1}^{k+dmax} \lambda_{6j} LNPCI_{t--j} + \sum_{i=1}^{k} \lambda_{7i} LNTD_{t-i} + \sum_{j=k+1}^{k+dmax} \lambda_{8j} LNTD_{t-j} + \varepsilon_{3t} \tag{6}$$

$$LNTD_t = \Psi_0 + \sum_{i=1}^{k} \Psi_{1i} LNTD_{t-i} + \sum_{j=k+1}^{k+dmax} \Psi_{2j} LNTD_{t--j} + \sum_{i=1}^{k} \Psi_{3i} LNTI_t + \sum_{j=k+1}^{k+dmax} \Psi_{4j} LNTI_{tj} + \sum_{i=1}^{k} \Psi_{5i} LNCPI_{t-i} + \sum_{j=k+1}^{k+dmax} \Psi_{6j} LNCPI_{t--j} + \sum_{i=1}^{k} \Psi_{7i} LNPCI_{t-i} + \sum_{j=k+1}^{k+dmax} \Psi_{8j} LNPCI_{t-j} + \varepsilon_{4t} \tag{7}$$

Where, PCI is Per Capita Income, TI indicates the total investment as a percentage of GDP, CPI is inflation and TD is Total Debt as a percentage of GDP. In the equations, β_i's, β_j's, α_i's , α_j's, λ_i's, λ_j's and Ψ_i's, Ψ_j's are the parameters to be estimated and ε_{1t}, ε_{2t}, ε_{3t}, ε_{4t} are the white noise error terms.

In this method, the results can be specified in the following manner. For example, in equation 4, LN PCI is dependent variable whereas LN TI, LN TD and LN CPI are independent variables. This equation measures the impact of total investment (LNTI), total debt (LN TD) and inflation rate (LN CPI) on the per capita income (LN PCI). Now, the null hypothesis can be set as: $\beta_{3i} = \beta_{5i} = \beta_{7i} = 0$. if $\beta_{3i} = 0$ is rejected, it indicates that total investment causes per capita income. In the same vein, the rejection of $\beta_{5i} = \beta_{7i} = 0$ would imply that changes in inflation and total debt would cause per capita income and vice versa. The test of hypothesis is done by Wald test where the Wald statistics has asymptotic chi-square distribution with k degrees of freedom.

5. Empirical Results

As mentioned above, the estimation of Johansen Juselius co integration test can accommodate variables which are non stationary at level and are integrated at same order. Hence, unit root test is necessary to check the order of integration of the time series. Furthermore, according to the Ajayi and Aluko (2016), the unit root test would provide the maximum order of integration d_{max} which is necessary to run the Toda-Yamamoto augmented Granger causality test. The Augmented Dickey Fuller test (1979) has been employed to find the maximum order of integration of the variables. The optimal lag length has been determined by the Schwartz Information Criteria (SIC) and also by using trial and error method. The results of the ADF test are presented in table II

Table – II

Unit root test (ADF) for the time period of 1980 to 2018

Intercept				
Series at Level			First Difference	
Variables	Test Statistic	Probability	Test Statistics	Probability
Ln pci	-0.611638 (1) **	0.8539	-17.41622 (0) **	0.0001
Ln ti	-0.274412 (3) **	0.9188	-16.45138(0) **	0.0000
Ln cpi	-1.514038 (1)	0.5155	-10.40817 (0) **	0.0000
LnTd	-1.603491(0)	0.4711	-5.060122(0)	0.0002

With Trend and Intercept

	Series at Level		First Difference	
Variables	Test Statistic	Probability	Test Statistics	Probability
Ln pci	-2.884712 (3)**	0.1825	-16.97372(0) **	0.0000
Ln ti	-1.589713 (2)**	0.7773	-4.819371(1) **	0.0022
Ln cpi	-3.008253 (2)**	0.1440	-10.26979 (0) **	0.0000
Lntd	-1.968279 (0)	0.5994	-4.489215(3)	0.0056

Note: i) ** indicates significance at the 5% level.

ii) Figures in the parentheses represent the optimal lag length

According to the results depicted in table-II, the time series are non stationary at level and stationary at first difference for both intercept and with trend and intercept. That is, all the variables are integrated of order 1, I (1). These results allow the conduct of Johansen Juselius co integration technique and also provide maximum order of integration for Toda-Yamamoto Granger non-causality test.

TABLE –III

JOHANSEN JUSELIUS TEST OF COINTEGRATION

Data Vector	Null Hypothesis	λ Trace	Probability	λ Max	Probability
LN PCI, LN TI LN CPI, LN TD	None	327.9610**	0.0001	267.1897**	0.0001
	At most 1	60.77135	0.0000	36.92232	0.0042
	At most 2	23.84903	0.0022	22.04121	0.0024
	At most 3	1.807821	0.1788	1.807821	0.1788

Note- i): Test assumption includes linear deterministic trend in the series

ii): Optimal lag is 5 determined by Schwartz Information Criteria (SIC)

ii): ** indicates significant at the 5% level

The Johansen Juselius test of co integration approach has been applied to find the long run relationship among the variables. The result evident in table III suggests that there exist three co integrating vectors as both the trace and Eigen value statistics are less than 5% critical value at rank 3. This indicates that the variables are co integrated and have long run stable relationship.

Table IV

Toda-Yamamoto Augmented Granger Causality test

Null Hypothesis	Value of Chi Square	Probability	Inference
TI does not Granger cause PCI	1.030550	0.9051	Does not reject H_0
CPI does not Granger cause PCI	2427959	0.6576	Does not Reject H_0
TD does not Granger cause PCI	4.956584	0.2918	Does not reject H_0
PCI does not Granger cause TI	6.222251	0.1832	Does not reject H_0
CPI does not Granger cause TI	3.390769	0.4947	Does not reject H_0
TD does not Granger cause TI	5.113113	0.2759	Does not reject H_0
PCI does not Granger cause CPI	2.130789	0.71117	Does not reject H_0
TI does not Granger cause CPI	0.573579	0.9660	Does not reject H_0
TD does not Granger cause CPI	0.865030	0.9295	Does not reject H_0
PCI does not Granger cause TD	23.94546	0.0001	Reject H_0
TI does not Granger cause TD	18.01158	0.0012	Reject H_0
CPI does not Granger cause TD	45.73986	0.0000	Reject H_0

Table IV reports the results of Toda-Yamamoto augmented Granger causality test. The results as stated in table IV do not necessarily depict the investment led income growth in Bangladesh as the result found no causal relationship between total investment and per capita income in Bangladesh. The total debt, as it is mentioned earlier that should have the significant contribution in accelerating investment growth, however, the causality results evident that the total debt does not cause investment growth and thereby has found no positive impact on per capita income growth in Bangladesh. Furthermore, as the result depict, CPI has also found no causal effect on the per capita income in Bangladesh.

6. Conclusion and Policy Recommendation

The main objective of this paper was to empirically examine the effects of total investment on the per capita income of Bangladesh. The paper intends to investigate their relationship because compare to the rising trend of per capita income, the investment performance does not show any encouraging trend. Furthermore, the paper has also incorporated total debt and inflation as explanatory variables. Theoretically, if debt and inflation do not cause investment, it would indicate that the acceleration of total debt and stability in the inflation will not necessarily increase per capita income in the long run.

The long run linear relationship between the variables is confirmed by Johansen Juselius co integration approach while causal effects are tested by the Toda-Yamamoto Granger causality test. The empirical results suggest that total investment does not cause per capita income in Bangladesh. The result has also confirmed that total debt does not cause investment and thereby found no positive impact of total debt on per capita income. Nevertheless, as the results suggest, inflation has found no causality to investment and to per capita income.

However, the findings stated above have some serous policy implications for the government. In this study, the work has found no evidence of investment led income growth in Bangladesh. Moreover, no causality between debt and investment indicate poor performance of production oriented investment growth in Bangladesh. Hence, through this, the paper suggest government to put serious look on proper utilization of overwhelming debt and urges for implementing more investment oriented economic policy in Bangladesh.

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