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The Savings and Growth Nexus in Bangladesh

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Abstract

The paper investigates the causal relationship between Bangladesh's gross domestic savings (GDS) and gross domestic product (GDP). Using yearly time series data from 1980 to 2018, we employ two short-run and one long-run causality tests to identify the direction of causality between these two variables. We find unidirectional causality running from growth to savings in the short run. However, long-run causality is not found in any direction under any of the tests.

Keywords: Savings, Growth, VECM, Granger causality, Bangladesh JEL classification: C32, E21, E23, O16, O40

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1. Introduction

The relationship between savings and income is central to understanding economic growth dynamics. Unsurprisingly, this is a vastly researched relationship with a rich body of theoretical and empirical literature. The direction of causality in the relationship between economic growth and savings is of particular interest in the context of Bangladesh, as it has implications for macroeconomic policy. Although Bangladesh experienced high economic growth in the past three decades, its domestic saving rate remained below those of Asian countries which grew at comparable rates. Its gross domestic product (GDP) growth rate has increased one percentage point per decade since the 1980s. At 6.4 percent, its growth rate was 1.7 percent above the average of all least developed countries (LDCs) and 0.9 percent above the average of all lower-middle-income countries (LMICs). The savings rate of the country, on the other hand, has been relatively low. In the last 10 years (2009–2018), Bangladesh's gross domestic savings (GDS) rate as a percentage of GDP was 22.2 percent, whereas LMICs and LDCs saved 25.26 and 21.15 percent of their respective GDP. Although extensively investigated for many developed and developing countries, empirical studies on the savings-growth nexus for Bangladesh are particularly scarce.³

The theoretical literature on the subject does not point to a definitive conclusion on the direction of causality between the two important macroeconomic variables: economic growth and savings. “Capital fundamentalists” (Domar, 1946; Harrod, 1939) support the first line of causality, i.e., that physical capital accumulation is the main determinant of economic growth. Under the assumption that output is directly proportional to capital, the Harrod-Domar model predicts that output growth is directly proportional to savings, i.e., higher savings (which enable higher investment) increase economic growth. The neoclassical growth theory (Solow, 1956), which improves on the limitations⁴ of the Harrod-Domar model, also recognizes the importance of savings in the growth process. Assuming diminishing marginal returns to capital, constant returns to scale, and substitution between the factors of production, the Solow model postulates that a higher rate of savings has a level effect on the long-run rate of economic growth, i.e., a permanent increase in the savings rate permanently increases the steady-state level of output; however, the effect on the growth rate is transitory. In other words, increased capital stock increases the growth rate of output as it moves toward a new long-run steady-state equilibrium, but due to the diminishing rate of marginal returns to capital, the growth acceleration drops to zero as the economy reaches the new long-run output level (growth trajectory). The neoclassical endogenous growth models (Lucas, 1988; Romer, 1986) assume increasing returns to scale in contrast with constant returns to scale in the Solow model, and postulate that an increase in savings (and hence investment) rate will

³ The study conducted by Agrawal and Sahoo (2009), to the best of the authors' knowledge, is the only study in the literature to test the causality between savings and growth for Bangladesh. The study finds bidirectional causality between the two variables.

⁴ Issues such as labor productivity, technological progress, and population growth are ignored in the Harrod-Domar model.

increase the output growth rate not only in the short run but also in the long run. However, Keynesian theory (1936) reverses the causality suggested by neoclassical growth models and postulates that savings are determined by the growth of output. Modigliani (1970) also argued that savings are caused by income. The permanent income and life cycle hypotheses also assume that the level of consumption and savings are determined by income growth.

As with the general disagreement in the theoretical literature regarding the direction of causality between savings and growth, the empirical evidence, too, fails to provide a definitive conclusion on the nature of the relationship between savings and growth. The direction of causality differs across countries, and the causality associated with long- and short-run changes not only differs but can also be bidirectional (Andersson, 1999). A large body of empirical evidence suggests not only unidirectional causality from growth to savings but also vice versa. King and Levine (1994), for example, criticized capital fundamentalism, based on econometric analysis of 105 countries, and concluded that there is good reason to believe that economic growth causes savings rather than the other way around. Patra et al. (2017) found evidence of the direction of causality to be from savings to growth for the Indian economy. Tang and Tan (2014) found the same direction of causality for Pakistan.⁵

Examining the relationship between savings and growth in 64 countries using household-level data, Carroll and Weil (1994) also found evidence that indicated the direction of causality to be from growth to savings, and not the other way around. Analyzing data of more than 100 countries, Blomstrom, Lipsey, and Zejan (1996) showed unidirectional causality from higher economic growth to higher capital formation. The study argues that GDP growth induces subsequent capital formation rather than capital formation inducing growth. Gavin, Hausmann, and Talvi (1997) also found that growth causes savings in the case of Latin American countries. Sinha and Sinha (1998) found the same for Mexico.⁶ There is also some empirical evidence that suggests bidirectional causality (Sinha, 1999) or no causality (Konya, 2004; Sinha, 1996) in the literature.

⁵ See Agrawal (2000), Bacha (1990), DeGregorio (1992), Jangili (2011), Kumarasinghe (2007), Looney (1996), Misztal (2011), Morande (1998), Oladipo (2010), Otani and Villanueva (1990), Sajid and Sarfraz (2008), and Schmidt-Hebbel, Webb, and Corsetti (1992) for more evidence on causality from savings to growth.

⁶ See Agrawal, Sahoo, and Dash (2009), Alguacil, Cuadros, and Orts (2004), Cullison (1993), Mühleisen (1997), Sahoo, Nataraj, and Kamaiah (2001), Shahbaz and Khan (2010), Sinha and Sinha (2008), Verma (2007), and Verma and Wilson (2005) for more evidence on causality from growth to savings.

2. Trends in Savings and Growth in Selected Asian Countries

Bangladesh's GDS rate is still low despite its high growth in the past decade. This may be termed as its "savings predicament." A comparison of Bangladesh's GDS with selected Asian countries indicates that it is significantly lower than the other countries (see Table 1).⁷ Bangladesh's average savings rate was 22.5 percent compared with 31.5, 33.9, 32.3, and 48.8 percent for India, Indonesia, Thailand, and China, respectively, from 2010 to 2018. In other words, Bangladesh saved only two-thirds of what India, Indonesia, and Thailand saved out of their income and half that of China in this period. Further, Table 1 also shows that Bangladesh saved significantly less than these countries throughout the past four decades. It, however, saved significantly more than the Philippines. India and Thailand experienced a significant increase in the savings rate in every decade, while Indonesia experienced it in the 1990s. China's growth historically relied on high rates of capital formation to achieve high growth rates, as evidenced by its high savings rates.

Table 1 Gross Domestic Savings (GDS) Rate Across Selected Asian Countries

Period	Bangladesh	China	India	Indonesia	Philippines	Thailand
1980–1989	12.3	35.0	15.8	26.7	23.0	26.0
1990–1999	15.4	39.7	23.9	28.3	15.4	35.8
2000–2009	20.6	44.5	29.9	28.3	16.0	31.5
2010–2018	22.5	48.8	31.5	33.9	15.9	32.3

Source: Authors' calculation based on World Development Indicators

In the 1980s, Bangladesh experienced an average GDP growth rate of 3.5 percent (see Table 2). In the three subsequent decades, the average growth rate increased by about one percentage point every decade. The estimates in Table 2 also show that Bangladesh's average GDP growth rates in the two decades since 2000 surpassed those of Indonesia and Thailand, but remained below those of China and India. The

⁷ Note: Indonesia, Thailand, and the Philippines were hit hard by the Asian Financial Crisis in 1998–1999. Therefore, the GDS for the three countries in 1998 and 1999 were excluded while calculating the average in the decade. This permitted an accurate comparison of the 1990s with other decades. A similar adjustment was made while computing the average GDP growth rate for the three countries in the 1990s.

Philippines finally crossed the 6.3 percent GDP growth threshold in 2010–2018, but as noted earlier, its average savings rate was only 16 percent.

Table 2. Gross Domestic Product (GDP) Growth Rate Across Selected Asian Countries

Period	Bangladesh	China	India	Indonesia	Philippines	Thailand
1980–1989	3.5	9.7	5.7	5.8	2.0	7.3
1990–1999	4.7	10.0	5.8	6.4	2.9	7.8
2000–2009	5.6	10.4	6.3	5.1	4.5	4.3
2010–2018	6.6	7.8	7.0	5.5	6.3	3.8

Source: Authors' calculation based on World Development Indicators

Bangladesh's gross national investment (GNI) as a percentage of GDP increased steadily from an average of 102 in 1980–1989 to 106.7 percent in 2010–2018 (see Table 3). In China, the GNI rate remained stable at about 100 percent over the four decades, while in India, it ranged from 98.3–99.5 percent over the same time frame. The GNI rate for Thailand declined from 98.6 percent in 1980–1989 to 95.4 percent in 2010–2018, whereas it increased by 1.2 percent for Indonesia over the same time period. The GNI rate for the Philippines increased dramatically from 96.8 to 120.6 over the same four decades.

Table 3. Gross National Investment (GNI) as Percentage of Gross Domestic Product (GDP)

Period	Bangladesh	China	India	Indonesia	Philippines	Thailand
1980–1989	102.0	100.1	99.5	95.7	96.8	98.6
1990–1999	102.7	99.3	98.8	95.7	104.5	97.7
2000–2009	105.1	99.5	99.3	95.8	118.2	96.5
2010–2018	106.7	99.6	98.9	96.9	120.6	95.4

Source: Authors' calculation based on World Development Indicators

3. Data and Methodology

We use annual data of Bangladesh's GDS and gross national savings (GNS) from 1980 to 2018, i.e., a sample of 39 data points. Both annual time series are in constant US dollars of 2010. For purposes of the estimations below, we use the GDS and GDP data in logarithmic form. The data were collected from the World Development Indicators, World Bank.⁸ The paper checks for causality between GDS and GDP using a vector error correction model (VECM), which allows the two variables to be determined simultaneously.

Consider the following VECM with two variables, log of GDP (LGDP) and Log of GDS (LGDS):

$$\Delta LGDP_t = C_1 + \sum_{i=1}^{K-1} \alpha_i \Delta LGDP_{t-i} + \sum_{j=1}^{K-1} \beta_j \Delta LGDS_{t-j} + \theta_1 ECT_{t-1} + U_{1t} \quad (1)$$

$$\Delta LGDS_t = C_2 + \sum_{i=1}^{K-1} \gamma_i \Delta LGDP_{t-i} + \sum_{j=1}^{K-1} \delta_j \Delta LGDS_{t-j} + \theta_2 ECT_{t-1} + U_{2t} \quad (2)$$

Where, K is the optimal lag length of the underlying vector autoregression (VAR)—selected by the information criteria, e.g., Akaike information criterion (AIC) and Schwarz information criterion (SIC); C_1 and C_2 are scaling constants; α_i , β_j , γ_i , and δ_j are the short-run dynamic coefficients of the model's long-run equilibrium; θ_1 and θ_2 are the speed of adjustment coefficients; ECT_{t-1} is the error correction term which contains long-run information derived from the cointegrating relationship; and U_{it} are the error terms.

The VECM allows causality to be checked through three different tests: the long-run causality from the error correction term (ECT), the short-run causality from the VEC Granger causality or block exogeneity Wald test, and the pairwise Granger causality test. These three tests work as robustness checks for each other. Most studies rely on at least one of these tests to identify the direction of causality (e.g., Misztal, 2011; Patra et al., 2017).⁹ In this study, all three tests were used to detect the direction of causality between savings and growth.

The first test of long-run causality involves testing the statistical significance of the speed of adjustment coefficients— θ_1 and θ_2 . For example, if θ_1 is statistically significant, we can infer the long-run causal effect of savings on growth.

The second test—VEC Granger causality or block exogeneity Wald test—is performed by checking the joint significance of the short-run dynamic coefficients. For example, in the following hypothesis, the rejection of the null hypothesis implies the short-run causal effect of savings on growth. This test involves testing a chi-squared statistic with K-1 degrees of freedom.

$$\begin{aligned} \text{Null: } & \beta_1 = \beta_2 = \beta_3 = \dots \beta_{k-1} = 0 \\ \text{Alternative: } & \beta_1 = \beta_2 = \beta_3 = \dots \beta_{k-1} \neq 0 \end{aligned}$$

⁸ <https://databank.worldbank.org/source/world-development-indicators>

⁹ Other useful references are: Adebisi (2005), Agrawal and Sahoo (2009), Bankole and Fatai (2013), Mohan (2006), Najarzadeh, Reed, and Tasan (2014), Sajid and Sarfraz (2008), and Saltz (1999).

The third test—pairwise Granger causality test—is also a short-run test of causality. It takes variables in pairs and tests the statistical significance of an F statistic with degrees of freedom for the following hypotheses:

Null: No Granger causality
 Alternative: Granger causality exists

A statistically significant value of F indicates that savings Granger causes GDP in the short run (1) or GDP Granger causes savings in the short run (2).

Before performing the three causality tests, we will apply the augmented Dickey-Fuller (ADF) test to know the order of integration of the variables. We will also do the Johansen cointegration test (Johansen 1991; Johansen & Juselius 1990) to identify if there was any long-run equilibrium relationship between the variables.

4. Empirical Results

The ADF test results presented in Table 4 indicate that the LGDP and LGDS are non-stationary at their levels and stationary at their first differences, i.e., both variables are I(1).

Table 4. Augmented Dickey-Fuller (ADF) Test

Variable	Level		First difference		Decision
	t statistic	p-value	t statistic	p-value	
LGDP	1.07	0.99	-4.48***	0.00	LGDP is I(1)
LGDS	1.79	0.98	-6.22***	0.00	LGDS is I(1)

Note: Optimal lag length is selected automatically by the Eviews software
 *** indicates statistical significance at one percent level

Table 5 below presents the result from the Johansen test. We have taken five autoregressive lags of the variables suggested by the AIC. The null hypothesis of no cointegration is rejected at the one percent level of significance under both the trace statistic and the maximum eigenvalue statistic. However, the null hypothesis of more than one cointegrating relationship is not rejected under either test statistic. Therefore, we conclude that LGDP and LGDS are cointegrated, i.e., they together form a long-run equilibrium relationship.

Table 5. Johansen Cointegration Test

VAR	VAR lag length	Hypothesis		Trace statistic	Maximum eigenvalue statistic	Decision
		H_0	H_1			
LGDP, LGDS	5	$r=0$	$r>0$	24.43***	20.03***	1 cointegrating relationship
		$r\leq 1$	$r=2$	4.4	4.39	

Note: Optimal lag length selected according to the Akaike information criterion (AIC) criterion

*** indicates statistical significance at one percent level

Since the two variables—LGDP and LGDS—are cointegrated, there is causality in at least one direction (Engle & Granger, 1987). Table 6 presents the result of our first test of causality. The adjustment coefficient of the LGDP equation (i.e., θ_1) is positive, which indicates that any short-run deviation from the long-run equilibrium takes the relationship away from the equilibrium. That is, the LGDP equation (1) above is not stable in the long run. Therefore, we conclude that there is no causality from growth to savings in the long run. However, in LGDS equation (2) above, the opposite is observed—the adjustment coefficient (i.e., θ_2) is negative, indicating a long-run causal relationship between savings and growth in which the direction of causality is from savings to growth and that the long-run equilibrium is stable. However, the long-run causal effect is statistically insignificant (significant at 12 percent level).

Table 6. Long-Run Causality Test From the Error Correction Term (ECT) of the Vector Error Correction Model (VECM)

Adjustment coefficient	p-value	Decision
$\theta_1 = 0.004$	0.00***	No long-run causality from LGDS to LGDP
$\theta_2 = -0.012$	0.12	Weak long-run causality from LGDP to LGDS

*** indicates statistical significance at one percent level

Next, we test the short-run causality using the VEC Granger causality/block exogeneity Wald test. Results indicate that Null: $\beta_1 = \beta_2 = \beta_3 = \dots \beta_{k-1} = 0$ with confidence, i.e., we fail to reject the null hypothesis that LGDS does not cause LGDP. Therefore, we conclude that there is no short-run causality from LGDS to LGDP. But the null hypothesis that “LGDP does not cause LGDP” is rejected at one percent level of significance, which implies that there is causality from LGDP to LGDS in the short run.

Table 7. VEC Granger Causality/Block Exogeneity Wald Test

Null hypothesis	Test statistic (Chi-squared)	Decision
$\beta_1 = \beta_2 = \beta_3 = \dots \beta_{k-1} = 0$	7.38	No short-run causality from LGDS to LGDP
$\gamma_1 = \gamma_2 = \gamma_3 = \dots \gamma_{k-1} = 0$	16.99***	Short-run causality from LGDP to LGDS

*** indicates statistical significance at one percent level

The third and final test—the pairwise Granger causality—also tests causality in the short run. The results of this test are consistent with those of the previous test. The parameter estimates shown in Table 8 indicate that there is a unidirectional causality from LGDP to LGDS.

Table 8. Pairwise Granger Causality Test

Null hypothesis	Test statistic (F)	Decision
LGDS does not cause LGDP	0.27	No short-run causality from LGDS to LGDP
LGDP does not cause LGDS	2.82***	Short-run causality from LGDP to LGDS

*** indicates statistical significance at one percent level

5. Summary and Conclusions

Bangladesh’s growth performance from 1990 to 2019 has been nothing short of impressive, averaging at 6.5 percent per year. In recent years, it has increased to over 7 percent. However, its GDS rate increased from 15 percent to only 22 percent. In contrast, China, India, Indonesia, and Thailand had significantly higher savings rates (see Table 1) from 1980 to 2019. The Philippines, like Bangladesh, had a low savings rate. A common feature of both countries is the large remittances and their broad-based growth effects in these economies. In both Bangladesh and the Philippines, GNS rather than GDS increased investment. In the case of Bangladesh, domestic savings clearly were not the key driver of growth contrary to the view of the capital fundamentalists. This group of growth theorists includes Harrod (1939) and Domar (1946); neoclassical growth theorists, e.g., Solow (1956[MG1]); and endogenous growth theorists, e.g., Romer (1986), Lucas (1988), and others. Keynes (1936) and

Modigliani (1970[MH2]), however, took the opposite view and suggested that income drives savings rather than the other way around. Mirroring the theoretical debate, the empirical literature, too, does not provide unequivocal evidence to support either view, and further suggests that the causality between growth and savings is bidirectional for many countries. There is a large body of empirical evidence suggesting that the causality between income and savings runs from the former to the latter.

This paper attempted a rigorous treatment of the relationship between savings and economic growth in the case of Bangladesh, and started by asking if savings drive economic growth or if the causation runs the other way, i.e., from economic growth to savings. The empirical analysis deployed a series of robust econometric tests to determine stationarity of the two variables, cointegration, and alternative long- and short-run causality tests. Our findings suggest that in the short run, the direction of causality between savings and economic growth is unidirectional from economic growth to savings. In the long run, there is no evidence of causality in either direction at an acceptable level of statistical significance. Therefore, the savings-growth relationship in Bangladesh is not consistent with the view of capital fundamentalists or neoclassical growth theory, including endogenous growth theory. In other words, higher economic growth rates induced savings in Bangladesh. This is consistent with a large body of empirical literature for low- and low-middle-income countries as noted above. Lower-income countries tend to have less savings capacity—lower GDS. This implies that economic policies directed at targeting savings directly as a means to increase economic growth are likely to be less effective. Instead, policies which enhance domestic resource mobilization, investment in human capital, external assistance, foreign direct investment, and their efficiency are likely to increase domestic investment and through it, economic growth, which in turn would be more effective, allowing savings to increase (Deaton, 1995).

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