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Estimating Potential Growth for Bangladesh: The Performance Gap and Policy Implications

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Abstract

Potential output growth, as different from actual output growth, determines how much growth the economy is sustainably capable of achieving by deploying its capital, labor, and productivity. While potential growth is used as an essential guideline for policymaking in all developed countries and also in many developing countries, Bangladesh has ignored the estimation of potential growth due to not only data scarcity, but also policymakers' lack of interest in it. This article estimates potential growth for Bangladesh over the 1985-2018 period. Although the country's recent annual GDP growth rate of over 7 percent seems commendable, its potential growth appears to be even higher by around 2 percentage points. The gap between the potential growth and actual growth has been dwindling slowly since the late 2000s, not only because of acceleration in actual growth, but also due to deceleration in potential growth, caused by the gradual fall in the rates of capital formation, labor supply, and productivity. Hence, reverting the falling trend of potential growth is as important as raising actual growth. To make it happen, improving growth in investment along with factor productivity and adopting reforms to improve efficiency across the board are required.

1 Introduction

A country's potential output growth gives us the measure of its sustainable growth, which a country is capable of maintaining using its inputs and technology without running into inflationary pressure. Deriving potential growth for Bangladesh is needed to find a desirable benchmark which would indicate how the economy should perform in coming years. This benchmark guides policymaking for private enterprises and for the regime. Hence, its derivation has drawn crucial attention in macroeconomic literature.

All developed countries and some developing countries now engage in statistical and econometric exercises on how to obtain the right measure of GDP (CBO, 2004; Feldstein, 2010; Goyal and Arora, 2012; Fernald, 2014). Bangladesh is among the developing nations that have not developed any definite method for estimating potential growth, however a number of fast-growing economies in the region including India and Sri Lanka have already started calculating potential growth in planning and policymaking. The research area of whether Bangladesh's actual growth has been either over or underperforming the potential growth has been relatively unexplored. This article fills that gap by estimating potential growth for the Bangladesh economy based on the production function in a supply side approach.

The fiscal authority in Bangladesh always strives to increase output growth, while monetary policy is expected to consider whether the growth level is above or below the potential level, because stimulating growth above the potential level will be inflationary, as per the Phillips curve. However, monetary policy is often not robust in Bangladesh due to two reasons: 1) the fiscal authority determines growth and inflation targets that are heavily based on political aspirations and the monetary authority normally follows suit, and 2) monetary policy has no benchmark for potential growth that the central bank can use for either monetary expansion or contraction.

Bangladesh's planning authority targets growth for the medium run without any rigorous analysis of potential economic growth, leaving room for questioning whether the planning was either ambitious or conservative. This study seeks to address these policy anomalies by providing a guideline for the country's fiscal, monetary, and planning stances. Despite a plethora of studies in this area, estimating potential growth has always remained a challenging task for developing economies mostly because of data scarcity in the areas of capital stock, labor supply, and factor productivity. Fortunately, this does not appear to be a problem for Bangladesh, due to availability of data from the Bangladesh Bureau of Statistics (BBS) and many global sources.

To briefly summarize the results: this study finds that despite Bangladesh's commendable output growth performance particularly in the recent decade, the growth rate still remains below its potential level by around 2 percentage points. Potential growth, however, has shown a trend of deceleration due to declining growth in productivity, capital formation, and labor supply. This trend can be reverted substantially by improving the investment growth rate and labor force participation rate, by increasing the number of formal workers in total employment, and by raising overall productivity in labor and capital through reforms that improve institutions, knowledge, and technology.

The remainder of the paper has been organized in seven sections: Section 2 presents literature review, Section 3 defines potential growth and describes its importance for an economy, Section 4 outlines different methodologies, Section 5 uses the most appropriate method to estimate potential growth, Section 6 determines the performance gap, Section 7 discusses policy implications of this study, and Section 8 concludes the paper.

2 Literature Review

The existing literature on potential output growth concentrates on the developed countries, leaving a huge gap for the developing countries. This gap is starkly evident for Bangladesh, since other economies in the region such as India, China, Pakistan, Sri Lanka, Malaysia, and Indonesia have already started calculating potential output. Historically, potential output has been utilized as an important variable in designing five-year plans in different countries. Deriving potential output has been essential in analyzing the output gap in business cycles studies (Paul, 2008; 2009a; 2010; Paul and Zaman, 2015). In a study of India, Goyal and Arora (2012) find that a 2-percent underestimation of potential output leads to a 50-basis point rise in policy interest rates. Hence, the correct estimate of potential output is imperative for the right operation of monetary policies.

The US Budget Office argues that potential output is often underestimated (CBO, 2015). This is more prevalent in developing countries where markets are not efficient and investment opportunities remain unexploited. Consequently, their potential output is likely to be above their actual output. Using Okun's law, Kahn (1996) estimates the US potential output growth for the 1990s, where he decomposes estimated potential growth rate into labor productivity growth and labor input growth to separate the secular trend from the cyclical changes. Feldstein (2010) re-estimated the US potential growth and found it to be 1.9 percent for the 2010s. The European Commission regularly estimates potential output for most European countries (Denis et al., 2006). The National Bureau of Economic Research (NBER) has a number of studies on potential output, which are used to officially date the US business cycle (Fernald, 2014; Gordon, 2014). The US Congressional Budget Office (CBO) routinely derives potential output, which is used to advise the US government on macro policies (CBO, 2004; 2014). In 2015, the US Federal Reserve Bank raised the policy interest rate after 8 years, as the output level reached too close to the potential level. US policymakers have been able to reduce business cycle volatility remarkably since 1984 by accurately estimating potential output and following stabilization policies accordingly (McConnell and Perez-Quiros, 2000).

Burns et al. (2014) described a parsimonious methodology employed by the World Bank for estimating potential output for 159 developing nations using the production function. The IMF has developed several methods for estimating potential output over time. As De Masi (1997) asserts, the concepts of potential output and the output gap are central to the IMF's analytical work in providing policy recommendations to its member governments. They estimated potential output for emerging Asian nations (Anand et al., 2014) and also for the Middle East and North African countries (Mitra et al., 2015). Herd and Dougherty (2007) found that the potential growth for China and India is 10 percent and 8 percent, respectively. Zheng et al. (2009) revised China's potential output growth to 9 percent for the early 2010s. Wolf (2016) finds a lower level of growth for China at 6 to 7 percent and asserts it as China's new normal. Ball and Mankiw (2002) believe that potential output growth should be revised from time to time since the business cycle changes.

The literature suggests that Bangladesh's neighboring economies are well ahead in estimating potential output. Goyal and Arora (2012) found that India's output reached the potential level only in 2007-08 when growth rate exceeded 9 percent, and also there was no sustained excess of growth over potential in the period 2010-11. The Indian Planning Commission and the Reserve Bank of India have routinely estimated the potential output for a long time. India's 3rd Five-Year-Plan (1961-1965) used the concept, and the latest 13th FYP (2016-2020) uses an updated concept. Adnan and Khan (2008) estimated the potential output for the Pakistan economy, and Ding et al. (2014) found that Sri Lanka's potential output has risen slightly in the last few years.

As the literature asserts, analyzing potential growth is not only important for policymaking, but it also unveils important insights into areas of capacity utilization, resource mobilization, and the direction of both private and public investments. However, it appears that the concept of potential growth has not drawn adequate attention yet at the policymaking level in Bangladesh.

3 Definition and Policy Implications

This study uses both potential growth and potential output interchangeably since we can derive growth from output by using the percentage form:

$$g_t = \frac{Y_t - Y_{t-1}}{Y_{t-1}}; or\ in\ log: g_t = \ln\left(\frac{Y_t}{Y_{t-1}}\right) \quad (1)$$

where *g* stands for growth at time *t, Y* is output at time *t*, and *Yt*−1 is output at time *t-1*. Potential growth is the level of growth that an economy can achieve by ensuring full employment in the labor market and ascertaining the best possible utilization of other existing resources and technology. The Non-Accelerating Inflation Rate of Unemployment (NAIRU) of 5.5 percent is the natural rate of unemployment which refers to the natural level of employment in the US (Ball and Mankiw, 2002).

3.1 Defining Potential Growth

CBO defines potential output as an estimate of "full-employment" Gross Domestic Product, or the level of GDP attainable when the economy is operating at a high rate of resource utilization. Potential GDP is a measure of the economy's maximum sustainable output, in which the intensity of resource use is neither adding to nor subtracting from inflationary pressure (CBO, 2004). Thus, potential output relates to the concept of full employment or the natural level of unemployment:

$$Y^P = (N_n / N_t)GDP_t = [(1-u_n)/(1-u_t)]Y_t \quad (2)$$

where Y^P stands for potential output, N_n for full employment level, N_t for the level of employment at time *t*, u_n for the natural level of unemployment or NAIRU, and u_t for the unemployment rate at time *t*. GDP_t and Y_t represent the level of output at time *t*. By using data from the Bureau of Labor Statistics (BLS, 2017:2) and the Bureau of Economic Analysis (BEA, 2017:2), US potential output for 2017 is:

$$\begin{aligned} Y_{US}^P &= \left[\frac{1-u_n}{1-u_t}\right] Y_t \\ &= \left[\frac{1-0.055}{1-0.048}\right] * 18.861 \\ &= \$18.722\ tn \end{aligned} \quad (3)$$

The economy seemed slightly overheated in 2017 since actual output was above potential output by a small margin. This induced the Federal Reserve to consider tightening monetary policy, which was ultimately delayed due to economic distress in Europe.

The output gap between the actual output and potential output can be estimated as:

$$\begin{aligned} &Y_t = \alpha + Y_{Trend} + \varepsilon_t \\ &\Rightarrow og_t = Y_t - Y_{Trend} - \alpha \\ &= \varepsilon_t \end{aligned} \quad (4)$$

where og_t stands for the output gap at time *t* – an amount that measures the gap between the actual output and its trend plus constant values. The output gap is positive when the economy performs over the trend, and negative when the economy falls below the trend line.

3.2 Policy Implications for Potential Growth

Without estimating the potential growth rate, policymakers cannot ascertain when the overheating or cooling of the economy begins. We can further elaborate the importance of deriving the potential growth for Bangladesh under several policymaking frameworks: fiscal, monetary, planning, and investment.

Fiscal Policy and Budgeting: The government's budgeting process becomes more transparent and robust when the estimated potential output is available. The challenge for the government is to ensure that the Debt-Output Ratio (DOR) is sustainable and risk free. Fiscal deficits [(Gt Tt)/Yt] and the DOR [Bt/Yt]are the main concerns of fiscal policy. Higher potential growth can help a nation keep the DOR constant even after raising government spending on capital formation. The change in the debt-output ratio can be written as:

$$\begin{aligned} &(B_t/Y_t) - (B_{t-1}/Y_{t-1}) \\ &= (r-g)(B_{t-1}/Y_{t-1}) + [(G_t - T_t)/Y_t] \end{aligned} \quad (5)$$

where B tstands for the debt level at timet, rfor the interest rate on the debt, g for the growth rate, Gtfor the government spending at time t, and Tt for Taxes at time t. As long as a country's output growth rate is as high as the interest rate on debts, the nation will not see any rise in the debt ratio. Rearranging the terms, we can write the above equation as:

$$\begin{aligned} &(B_t/Y_t) = (1 + r - g)(B_{t-1}/Y_{t-1}) \\ &+[(G_t - T_t)/Y_t] \end{aligned} \quad (6)$$

Foreign lenders will be interested in providing credit to a country with high potential growth, releasing some extra room for higher government spending on capital formation.

Monetary Policy Decisions: The basic classical theory of monetary growth is grounded in the Quantity Theory of Money (QTM), which dates back to the 16th century and has gone through various interpretations by different schools over time. If we assume the velocity of money to be constant and impose the idea of potential output, it turns into a behavioral equation.

$$\begin{aligned} &M\bar{V} = P\bar{Y} \rightarrow M \uparrow => P \uparrow, \\ &if\ Y \uparrow to\ \hat{Y}, M \uparrow => P\ doesn't \uparrow \end{aligned} \quad (7)$$

where *M* stands for money, *V* for the velocity of money, *P* for the price level, and *Y* denotes output or income. By

assuming that V and Y are constant ($\bar{V}$ and $\bar{Y}$), we are assuming them to operate at the full employment level, which suggests that money supply will be inflationary when actual output reaches its potential level or rises above it. If potential output can be raised to a higher level ($\hat{Y}$), policy decision for monetary growth becomes necessary, since this time increased money supply is absorbed by higher output and hence new money growth will not be as inflationary as before. This rationale becomes more evident if we write the QTM in a growth equation form:

$$\bar{g}_M \approx \bar{g}_Y + \bar{\pi} - \bar{g}_V, \quad if\ PG \uparrow => \bar{\bar{g}}_M \approx \bar{\bar{g}}_Y + \bar{\pi} - \bar{g}_V \tag{8}$$

where money growth (g_M) approximates output growth (g_Y) plus inflation (π) minus velocity growth (g_V) and all these variables are in the first steady state. If we find that potential growth (PG) has risen to a new state (g_Y), the central bank can increase money supply proportionately (to g_M) without stoking inflation, since growth in money velocity is assumed to remain constant. The Taylor Rule, despite reservations from many economists against it (see Bernanke, 2015), is still a useful suggestion for a monetary policy stance:

$$i_t = i^* + a(\pi_t - \pi^*) - b(u_t - u_n) \tag{9}$$

where i_t stands for the policy interest rate at time t, i^* is the basic interest rate that acts as a constant value, π_t is inflation at time t, $\pi*$ is the desired and tolerable level of inflation at the full employment level (also called the threshold level of inflation in developing countries), u_t is unemployment rate at time t, and un denotes the natural level of unemployment. Due to the lack of unemployment data, we can replace the last part of the above equation with output growth by using Okun's law (Okun, 1962):

$$i_t = i^* + a(\pi_t - \pi^*) + \beta(g_t - \bar{g}) \tag{10}$$

Per the above equation, if actual growth is equal to potential growth, then interest rate decision is based only on inflation. However, if actual growth is lower than potential growth, further monetary easing by lowering policy rates is warranted. Since growth is likely to be inflationary as per the Phillips curve (Phillips, 1958), if actual growth is far above the potential, the government budget should be strict on limiting fiscal deficits and the central bank should be conservative on money growth and policy rates. By using the Okun's law to replace the unemployment gap with the output gap, we get a modified Phillips curve. Since supply shocks play a dominant role in determining inflation, Gordon added them to the Phillips curve to better account for inflation (Gordon, 1975; 1977; 2006). The Gordon-style Phillips curve is:

$$\pi_t = c_0 + c_1\pi_{t-1} + \beta(y_t - \bar{y}) + \gamma SShocks + \varepsilon_t \tag{11}$$

If actual output is above potential output, the central bank should be worried about inflationary pressure and act accordingly. Likewise, the opposite policy move should be undertaken if potential output is above actual output. In a study of the Phillips curve for Bangladesh, Paul and Uddin (2017) suggest that raising output growth beyond its potential level will be inflationary. Thus, there are huge policy implications once we can determine whether the actual output is above or under potential output.

Long-Term Strategic Planning: Potential growth should be a crucial factor for five-year plans. Most nations use this concept for projecting their future path of growth and investment needs. Potential output will have a long-run effect on policy and growth. Domestic and international stakeholders are interested in learning the potential growth of a country for their decisions on the capital market and direct investment.

4 Estimation Methods and Current Methodology

Economists have developed a number of methods to determine potential output which can be divided into two broad categories:

4.1 Statistical and Econometric Methods

The advantage of statistical filters is that they can extract the trend from GDP directly by examining the series itself (French, 2001; Kuttner, 1994; Haltmaier, 1996; Laxton and Tetlow, 1992). These methods, as below, do not generally use Okun's law and do not require judgments about trend breaks.

a) The HP Filter: Researchers use the Hodrick and Prescott (HP) filter widely to derive potential growth particularly in developing economies where theory-based methods face numerous constraints. The easier derivation, simplicity, and some degree of flexibility have made the HP filter popular (see Hodrick and Prescott, 1997). Because of its simple smoothing technique, the HP filter is one of the most commonly used methods of estimating potential output (see Mitra et al., 2015). As a high pass filter, it minimizes the difference between actual and potential output while constraining the rate of change in potential output for the whole sample of T observations. Hence, the HP filter minimizes the following:

$$Min\sum_{t=1}^{T}(y_t - y_t^*)^2 + \lambda\sum_{t=2}^{T-1}[(y_{t+1} - y_t^*) - (y_t^* - y_{t-1}^*)]^2 \tag{12}$$

where *y* is the log of real GDP, $y*$ is the log of potential GDP, *T* is the length of the time series, and λ is a weighting factor that determines the degree of smoothness of the trend.

b) The Kalman Filter: It describes a recursive solution to the discrete-data linear filtering problem (Kalman, 1960). As Faragher (2012) asserts, the Kalman filter is over 50 years old, but is still one of the most important and common data fusion algorithms in use today.

c) The BP Filter: The Band Pass (BP) filter assumes that we can define business cycles as fluctuations of a certain frequency. Specifically, it is a linear filter that takes a two-sided weighted moving average of the data where cycles in a "band," given by a specified lower and upper bounds, are passed through, and the remaining cycles are filtered out. There are two types of BP filters: the Baxter-King method (Baxter and King, 1999) and the Christiano-Fitzgerald method (Christiano and Fitzgerald, 2003). Both approximate the ideal infinite BP filter assuming a cycle lasts from 1.5 to 8 years.

d) Simultaneous Econometric Models: Some researchers have specified full simultaneous systems of equations that describe the behavior of variables such as output, employment, productivity, and inflation (Adams and Coe, 1990). The parameters of these equations can be estimated using statistical techniques using certain assumptions.

e) Multivariate Time-Series Models: This category includes statistical methods of estimation known as vector autoregressions (VARs) and structural VARs (Demiroglu and Salomon, 2002; Blanchard and Quah, 1989; Dupasquier et al., 1997; St-Amant and Norden, 1997). These models are similar to econometric models in that they estimate the parameters of econometric equations using statistical techniques.

4.2 The Production Function Approach

This category is based on supply side theories (see Solow, 1957). The supply side approach to output uses a production function to derive sustainable long-term growth. The production function approach describes the functional relationship between output and its factor inputs. This method focuses on the supply potential of the economy and calculates potential output as the level of output given "normal" rates of capacity utilization. The rate of capacity utilization is assumed "normal" when the labor and capital input are consistent with nonaccelerating wages and inflation, and Total Factor Productivity (TFP) is at its trend level. The Cobb-Douglas Production Function (CDPF) with constant returns to scale is applied here as:

$$Y_t = A_t * K_t^{\alpha} * L_t^{(1-\alpha)} \quad (13)$$

where Y_t represents real GDP at time *t*, K_t is the stock of capital at time *t*, L_t is the labor force at time *t*, A_t represents TFP at time t, α is the share of capital in output, and (*1*-α) is the share of labor in output.

4.3 Methodology of the Current Study

The statistical approach takes the actual growth series and determines a trend by filtering the series; hence, the derived trend turns out data-biased by design. In contrast, the theory-based approach, which is based on the production function, derives a trend independent of the existing data by determining potential growth from capital, labor, and productivity factors. This study uses the production- function based methodology, and following most similar studies in the literature (see Lucas, 1990; Burns et al., 2014), this study also uses the constant returns to scale.

5 Data and Estimation

Data limitation has purportedly impeded studies on estimating potential output in Bangladesh. This section describes how this study addressed these impediments by reviewing other studies and adopting empirical judgment as needed. The study uses data from 1985 to 2018. The labor market data begin with new definition from 1985. Output and growth data from WDI (2017) are available up to 2016, and the respective data for 2017-2018 have been taken from the National Budget (Budget, FY2018).

5.1 Series for Estimation

To estimate equation 13, the following data series are needed - net capital stock, labor supply, share of capital in output and total factor productivity. Here we discuss how the study addressed some issues related to scarcity of data and how each of the data series was constructed to ultimately estimate the potential growth for Bangladesh.

Net Capital Stock: This is typically higher than the amount of annual output of an economy because capital is accumulated over time through capital formation or investment. This study uses the capital stock series from the Penn World Table (Penn, 2017). To match with the 1985- 2018 sample, the value of 2018 has been projected by the authors (see Figure 1). The calculation of net capital stock is:

$$K_t = K_{t-1}(1-\delta) + I_t \quad (14)$$

where K_t stands for net capital stock of the current year, Kt−1 is capital stock of the previous year, δ is depreciation rate, and It is investment of the current year. It is hard to find the average depreciation rate for the Bangladesh economy. The study uses the average

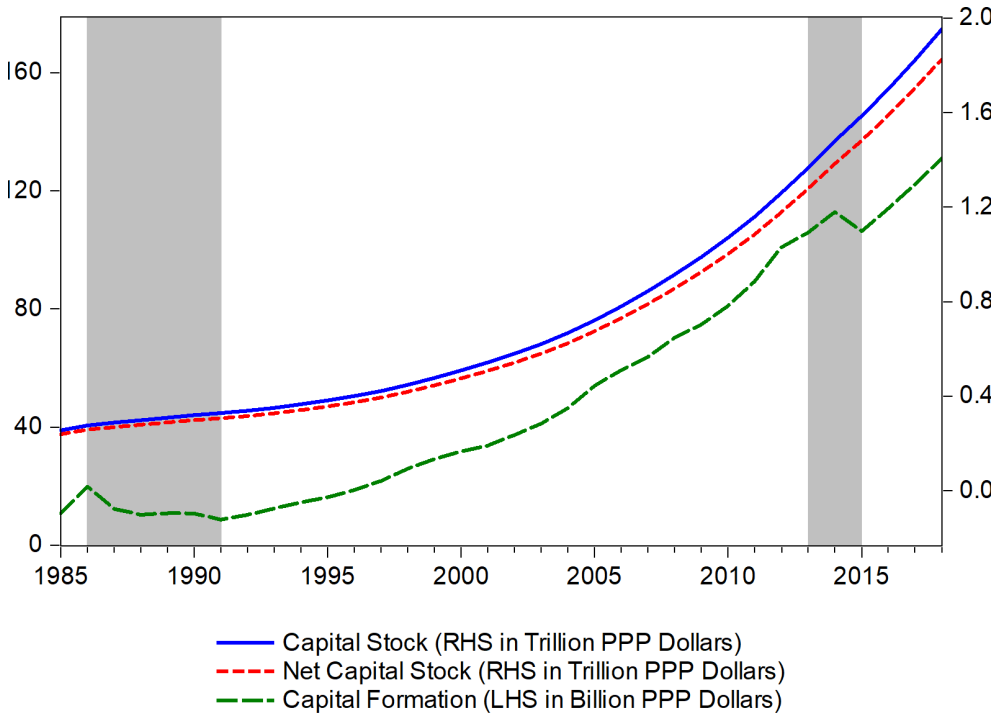

Figure 1: Capital Stock, Net Capital Stock, and Capital Formation

Source: Penn (2017), Burns et al. (2014), and Authors' Calculation

depreciation rate used for South Asian economies by Burns et al. (2014), which is 7 percent. Some studies have used lower rates such as 4 to 5 percent (see ADB, 2013), but this study uses a conservative rate. Figure 1 shows the net capital stock and annual capital formation series that experienced two declining phases in the second half of the 1980s and during 2014-2015, which were likely due to political instability and the ensuing economic uncertainty.

Labor Supply: This study needs to determine the level of employment that keeps output at a level which is grounded by the natural rate of unemployment, which is also called potential employment. Due to data paucity, some studies have used working-age population as a proxy of labor supply (see Burns et al., 2014), and some studies have used labor hours as proxy of labor supply (OECD, 2001; Denis et al., 2006; Roeger, 2006). In the case of Bangladesh, relevant data is available since the BBS routinely runs surveys on the labor market.

The labor supply series is derived from several labor data series that were collected from various BBS labor force surveys (1986-2017) and shown in Figure 2. Working-age population covering the 15-64 age group (WDI, 2017) declined to around 60 percent in the early 2000 from a high of 70 percent in the mid-1980s, and again has risen to almost 70 percent in recent years. The population growth rate has slowed down since the early 2000, but that slowdown was adequately offset by the rise in the working-age population. As a result, the trend line in the working-age population has become steeper than before since the mid-2000s.

The trend participation rate is collected from the BBS surveys (1986-2017). The participation rate is multiplied by the working-age population to derive the total labor force series. The participation rate has risen from 45 percent in the mid-1980s to 60 percent in the mid-2010s. As a result, the labor force has risen at a faster rate than the working-age population. The unemployment rate in Bangladesh is not comparable with that in developed countries. Bangladesh follows the ILO definition which defines a person employed if he/she has worked even for an hour over any time during the entire last week. This definition, largely loose by design, makes Bangladesh's unemployment rate appear very low. The trend unemployment rate started roughly at 1 percent some 30 years ago and has reached 4.4 percent in the mid-2010s, where it has remained in recent years. The potential level of employment is derived by deducting the potentially unemployed workers from the labor force, as shown in the following equation:

$$N_t = (1-u_n) * L \quad (15)$$

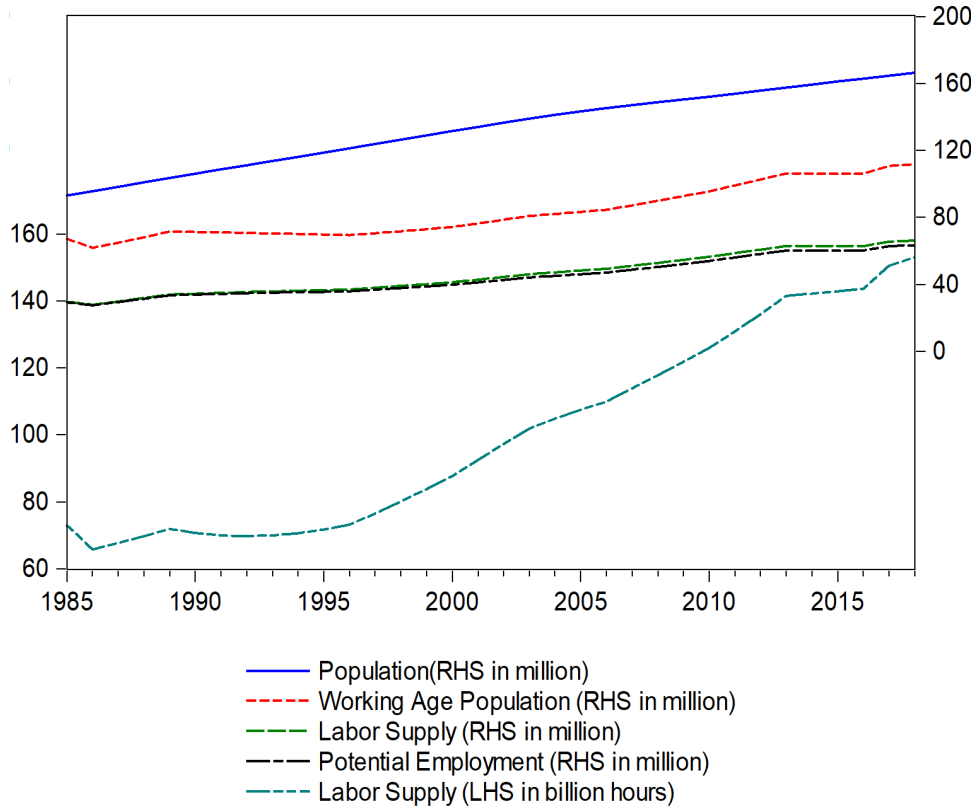

Figure 2: Population, Working-Age Population, Labor Force, Potential Employment, and Labor Supply

Source: BBS (1986-2017), WDI (2017)

Here, N stands for potential employment, u_n denotes the NAIRU, and L is the labor force. Next the labor supply is determined by multiplying the number of working hours with the number of potential employment, as shown in the equation below:

$$S_L = H_t * [(1-u_n) * L] = H_t * N_t \quad (16)$$

Here H_t denotes the average number of working hours per employed worker at time t. According to BBS surveys, the average working hours during the sample period began at 50, which steadily declined until the mid-1990s, and then continued to rise for a decade to reach 47 hours, where it has remained in recent years. The labor supply has been on an upward trend since the mid-1990s, which has become steeper since the mid-2000s due to the combined effects of rising working-age ratio, higher trend participation rate, and rising average working hours. A small rise in the trend unemployment ratio during this period was offset by the combined rise in these ratios.

Factor Productivity and Alpha: It is hard to find factor productivity series for Bangladesh economy. There is no time-series data on the country's capital productivity or total factor productivity (TFP). The labor productivity series is collected from the Conference Board (CB, 2017) and converted into an index as shown in Figure 3. The TFP is calculated by the following formula:

$$A = \kappa^{\alpha} \lambda^{1-\alpha} \quad (17)$$

where κ is the efficiency index for capital and λ is the labor productivity index. κ is multiplied with capital to derive the amount of effective capital and λ is multiplied with labor to derive the amount of effective labor. Thus, potential output turns out to be:

$$Y_t^P = [(\kappa_t * K_t)^{\alpha_t}] * [(\lambda_t * L_t)^{1-\alpha_t}] = A_t * K_t^{\alpha_t} * L_t^{(1-\alpha_t)} \quad (18)$$

Burns et al. (2014) derived a period-wise series of growth in TFP for South Asia, which this study uses for Bangladesh to construct an index series for TFP by adopting the progression formula and the HP filter, as shown in Figure 4. While the trend in labor productivity slightly sagged from the mid-1990s to the late 2000s, the trend in TFP did not show any such sign since it includes

capital as well. Alpha is not only the exponent on capital in this equation, but also it signifies the relative share of capital in the whole production process. The series of capital's share in output is collected from the Conference Board (CB, 2017), and is used by this study as alpha – the exponent of capital.

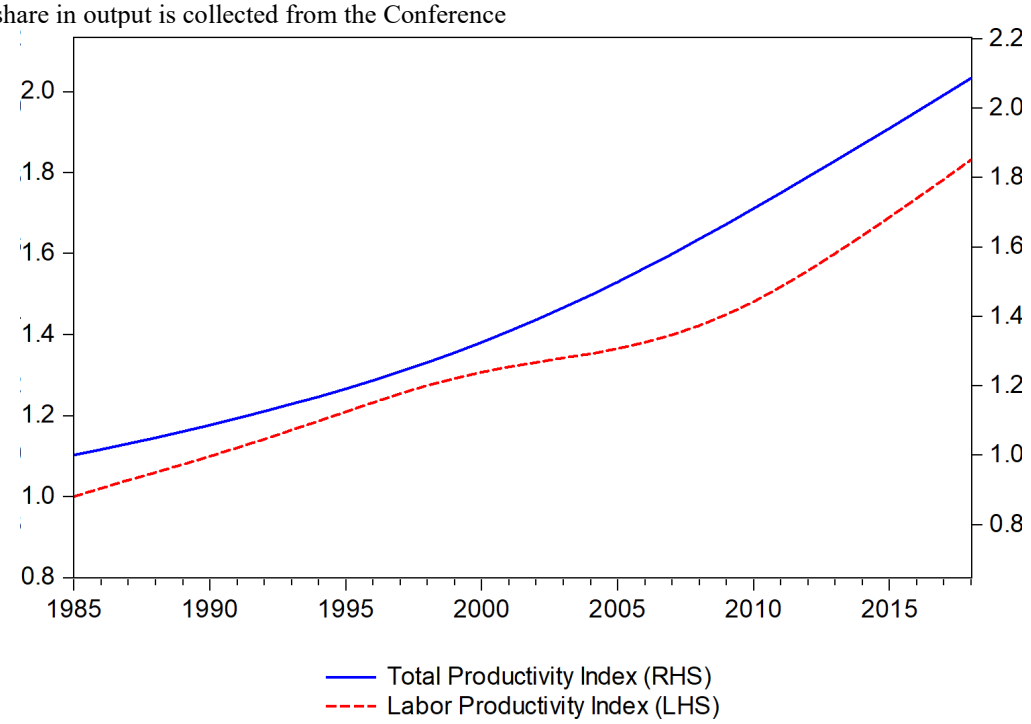

Figure 3: Labor Productivity Index and Total Factor Productivity Index

Source: CB (2017), Authors' calculation from Burns et al. (2014)

5.2 Estimation and Results

First, the potential output is derived by using equation (13) and then annual growth is derived by using equation (1). Next, the target series of potential growth is derived by trending this growth series with the HP filter. As shown in Figure 4, Bangladesh's potential growth is remarkably higher than the actual growth, which is consistent with the assertion by CBO (2004) that the actual output growth in most developing countries is lower than the potential level because of inefficient use of resources and suboptimal capacity utilization in productive sectors. The supply-side potential growth shows a decelerating trend since the early 2010s or precisely since 2012. Table 1 lists the differences between potential growth and HP trended actual growth. The policymakers in Bangladesh should explore why actual growth is remarkably below the potential level, and more importantly devise strategies to reach the potential level by adopting optimal fiscal and monetary policies along with five-year plans.

6 The Performance Gap

The performance gap is defined as the difference between actual growth and potential growth, which can be derived by subtracting the former from the latter.

Dynamics of the Performance Gap: Figure 4 displays the actual growth and potential growth for Bangladesh, which shows a widening performance gap during the early 1990s and late 2000s, that has closed somewhat during the 2010s. The Bangladesh government set a target growth of 7.4 percent in 2018, whereas the potential growth was 9.4 percent, creating a performance gap of 2 percentage points. It should be noted that since the actual growth path is subject to disturbances and fluctuations, the actual growth trended line is derived by the HP filter.

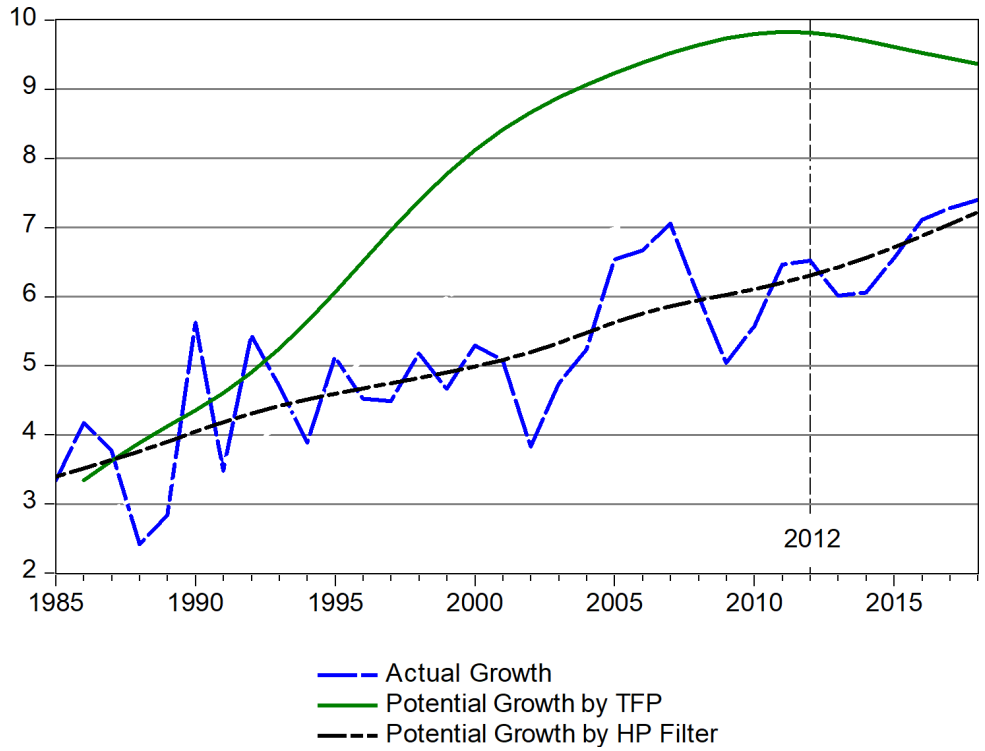

Figure 4: Actual Growth and Various Estimates of Potential Growth (in percent

Source: BBS (1986-2017), WDI (2017), CB (2017), Penn (2017)

Table 1 provides an overview of the performance gaps over the sample period, which has been divided into six 5-year periods and one 3-year period (2016-2018). The third item in the table (The Performance Gap) was derived by deducting the trended actual growth from potential growth and also by averaging within each period. The gap shows a hump over the entire sample period, which begins with a very small gap in 1985, reaches a peak in the 2006-2010 period by 3.68 percentage points, and then declines to 3.31 percentage points over 2011-2015 and to 2.4 percentage points in the 2016-2018 period. Although the declining gap is a sign of economic strength, the reduction in the gap in the later part of the sample has mixed messages. The gap declined not only for the rising actual growth, but also for the deceleration in the trend of potential growth, particularly since the late 2000s. Potential growth reached 9.83 percent in 2011 and then fell slowly since 2012, eventually reaching 9.36 percent in 2018. The fourth item in the table describes the growth volatility, which is an indicator of macro stability. The growth volatility gradually declined from the mid-1980s to the late 1990s, then increased until the mid-2000s and finally fell to a minimum around the end of the sample, indicating greater macro stability for the Bangladesh economy in recent years.

Table 1: Period-Wise Growth Rates and the Performance Gaps.

	Periods						
Averages of:	1986–1990	1991–1995	1996–2000	2001–2005	2006–2010	2011–2015	2016–2020
Potential Growth	3.87	5.29	7.37	8.85	9.62	9.75	9.45
Actual Growth (HP Trended)	3.77	4.40	4.83	5.34	5.94	6.44	7.05
The performance Gap[a]	0.10	0.89	2.52	3.51	3.68	3.31	2.40
Volatility in actual Growth	1.12	0.74	0.34	0.87	0.73	0.24	0.12

Notes: [a] The performance gap, meaning deficiency, is measured by deducted trended actual growth from trended potential growth.
Source: BBS (1986–2017), CB(2017), Penn(2017), WDI (2017), and Author's Calculation.

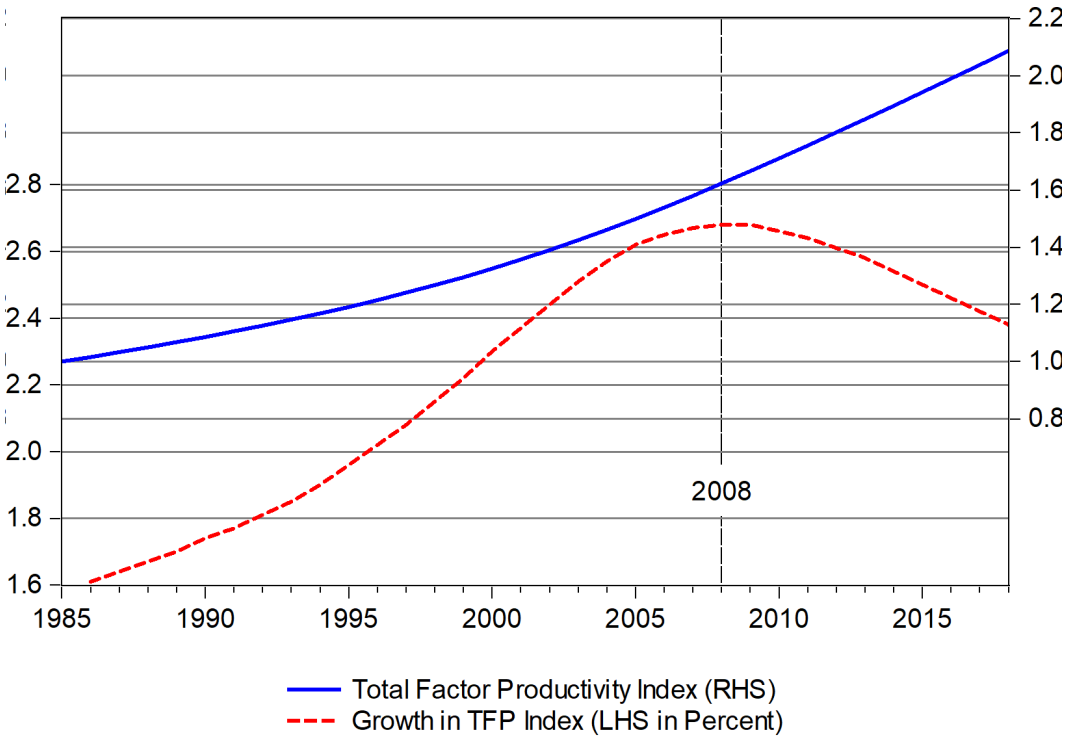

Figure 5: Total Factor Productivity (TFP) and Its Growth

Source: Burns et al. (2014) and Authors' Calculation

Deceleration in Potential Growth: As discussed in the previous section, the trend in potential growth has decelerated since the mid-2000s and the potential growth started declining since 2012. The reasons for this deceleration mainly include the falling rates of growth in TFP, net capital stock, capital formation or investment, potential employment, and labor supply. Figure 5 shows that the TFP index gradually increased during the entire sample period but at a decreasing rate, as shown by the Growth in TFP Index, which started falling after 2008, contributing to the deceleration in the trend of potential growth. This turning point coincides with the global financial crisis and the Great Recession in 2008. Bangladesh's openness to the global economy is not very high, however Burns et al. (2014) shows that many emerging economies also experienced a similar type of fall in TFP growth following the global financial crisis.

Figure 6 provides the second reason for the deceleration in potential growth – declining growth in net capital stock since the end of the 2000s, a timeline that coincides with the fall in TFP growth. While the net capital stock measures the accumulated capital after accounting for depreciation, its annual addition is due to capital formation, which also exhibited declining growth since the late 1990s (see Figure 6), contributing to the deceleration in the trend of potential growth. Last but not the least, the third critical factor is labor supply which shows an upward movement in Figure 7, but with a declining growth rate since the early 2000s. Labor supply is affected by potential employment, which has also exhibited declining growth since the late 2000s. Declining growth in potential employment has become a common feature in most developing economies due to population control measures. Population growth rate in Bangladesh was 2.73 percent in 1985, which dwindled down to 1.09 percent in 2018, and contributed to the gradual fall in potential employment. Figure 8 displays together the major factors of the deceleration in potential growth and shows how their growth lines synchronize to explain the slowdown in potential growth since the early 2010s.

7 Policy Implications

The policy implications of the estimated results warrant actions mainly along two lines: TFP and capital formation. The third factor related to the declining labor supply is largely unavoidable, because population growth is expected to fall due to public policies and people's preference for smaller families with greater modernization and higher standard of living.

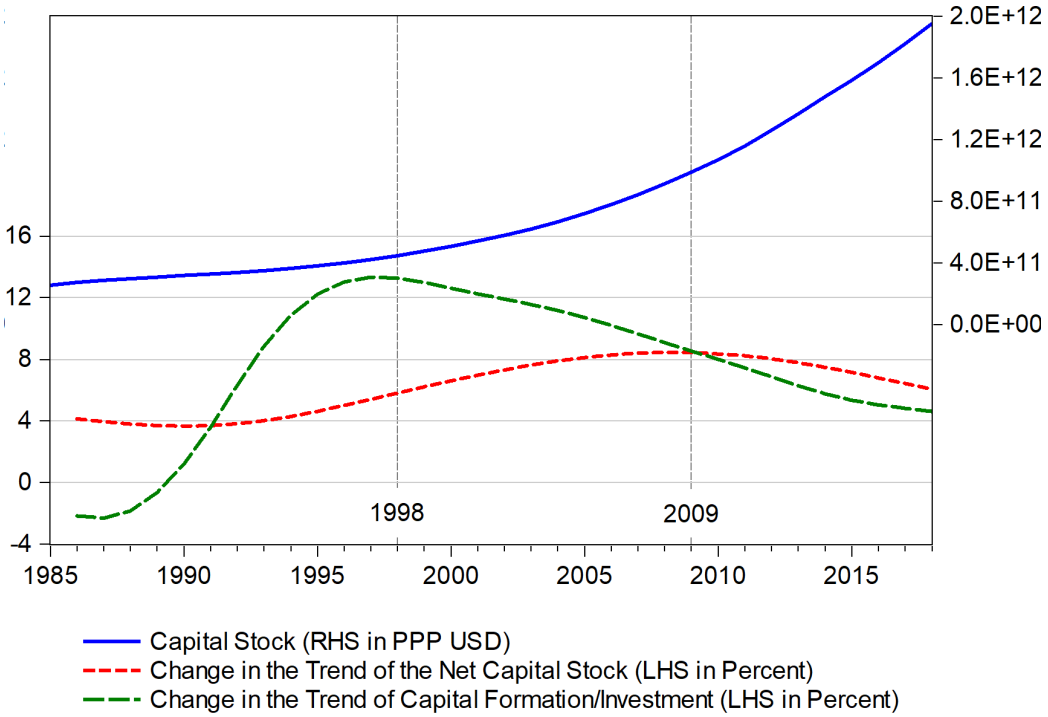

Figure 6: Net Capital Stock, Change in Net Capital Stock, and Change in Capital Formation

Source: CB (2017), Penn (2017), and Authors' Calculation

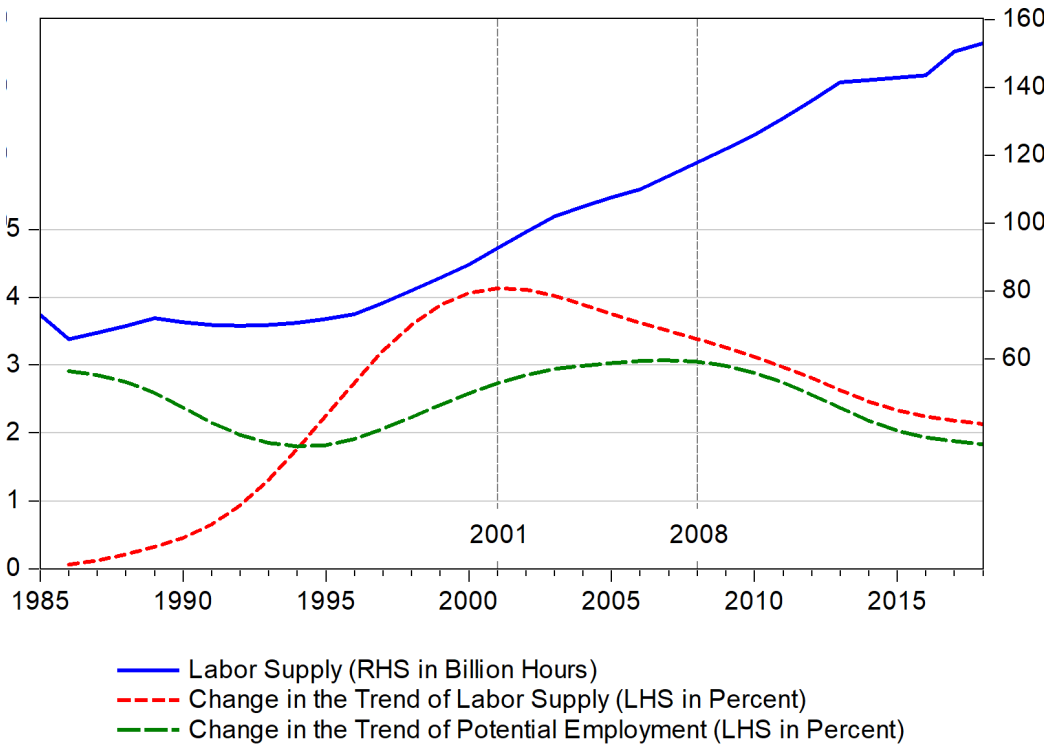

Figure 7: Labor Supply, Change in Labor Supply, and Change in Potential Employment

Source: BBS (1986-2017) and Authors' Calculation

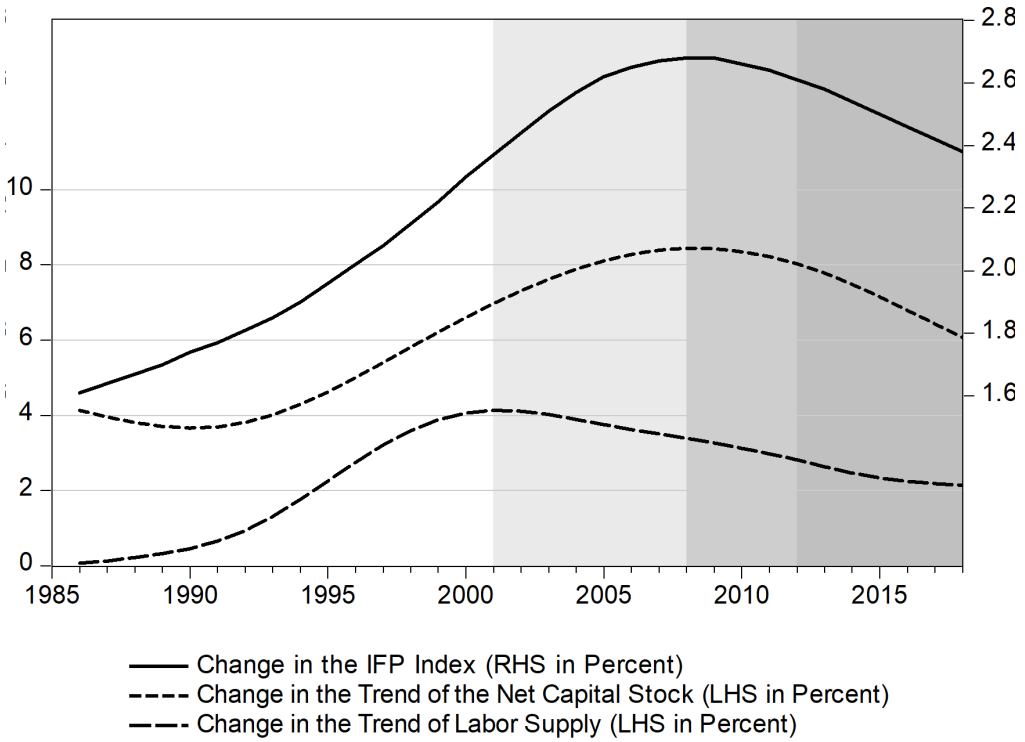

Figure 8: Rates of Change in the Trend Lines of TFP, Net Capital Stock, and Labor Supply

Source: BBS (1986-2017), CB (2017), Penn (2017), Burns et al. (2014), and Authors' Calculation

Total Factor Productivity: Policy efforts should be directed to increase labor productivity by improving the quality of education and healthcare. Increased growth in labor productivity can offset the declining growth of labor supply. Although policymakers have limited maneuverings in controlling labor supply, they can enhance TFP by introducing better technology and improving institutions. Although Bangladesh's TFP growth of 2.4 percent at the end of the sample period is respectable for South Asia, the countries of East Asia and the Pacific have lifted TFP growth as much as 4.5 percent over 2000-2013 (Burns et al., 2014). South Asian countries including Bangladesh should devise strategies to enhance TFP by at least another percentage point. An effective way to attain this goal is to increase the quantity and quality of capital stock, which can be achieved by raising investment and by reducing depreciation, which in turn can be achieved by reducing system losses, upgrading the quality of capital, enhancing skill base, and modernizing infrastructure.

Economic Reforms: The policy lesson is evident that when the regime embarked on liberalization and privatization in the early 1990s, the economy was put on track to achieve higher potential growth. The government undertook a number of reforms that unleashed private investments, contributing to faster growth in capital stock in a country where labor supply was already abundant. The potential growth momentum slowed down after 2000, suggesting that further acceleration of economic reforms was needed.

Bangladesh's poor performance in the Doing Business Index (DBI) reflects the deceleration in potential growth. The country ranked 177th out of 190 countries in the World Bank's DBI (WB, 2018). Since India started liberalization in the early 1990s, its annual economic growth reached almost 9 percent within 8 years and close to 10 percent within 16 years (Paul, 2009b); in 2010, India's growth reached 10.26 percent (WDI, 2017). Economic openness and higher rate of capital formation are significant reasons for India's faster growth than Bangladesh (Paul, 2013a; 2013b).

China would not have achieved high economic growth if Deng Xiaoping's leadership had not embarked on consistent macro policies and corrected institutions in the late 1970s – the genesis of China's double-digit growth (Vogel, 2011). The two decades of massive policy corrections in the 1980s and 1990s have not only helped China raise its potential output, but also to bring its actual output closer to the potential level. Despite the slow pace of privatization, the pace of liberalization remained high in both India and China in terms of price adjustment and easing business requirements.

Institutions and Foreign Investments: Consistent macro policies, better debt governance, and institutional reforms are warranted not only to attract quality foreign

investment, but also to reduce corruption as well as to minimize illicit capital outflows.

Macro policies in Bangladesh have three broad layers that involve three institutions of the government: the Ministry of Planning (MOP), the Ministry of Finance (MOF), and the central bank or Bangladesh Bank (BB). In the top layer, the MOP carries out medium-term planning for growth and employment for 5 years without accounting for potential growth. Their targets are often charged by political euphoria mingled with bureaucratic conservatism – a non-professional approach that most emerging countries do not follow nowadays.

In the second layer, the MOF attempts to remain consistent with the MOP's targets, and undertakes fiscal policy of budgeting for deficit financing and debt management. The BB falls in the third layer – which is not the case in any emerging country where the central bank takes the upper hand in policymaking and its fiscal authority remains compliant with monetary rules, or both institutions maintain a level-playing field and complement each other in policymaking. In Bangladesh, the MOF outlines major macro targets many of which should belong to BB's decision-making purview. For example, targeting inflation should entirely be the BB's policy parameter, but the MOF determines inflation target in its budget document much in advance the BB announces its monetary policy. Output growth is substantially influenced by the BB's credit whose share in GDP is more than double the share of the fiscal budget in GDP. Thus, the BB's compliant policies to political aspirations of the fiscal authority are often suboptimal and indicative of institutional disorder. This is likely to engender corruption as well as loan defaults that, in turn, may reduce capital formation due to poor banking governance and capital flights. These symptoms, once surfaced, invariably dispel quality foreign investments as reflected in the poor share of FDI in GDP, which has remained around as low as 1 percent for a decade since 2009 (WDI, 2017).

Had the estimates of potential output growth been available to all three institutions, projections on growth, employment, and inflation would have been grounded on solid professionalism without conflicts. Further, if potential growth of a country is higher than its actual growth, it creates an incentive for foreign investors since the country appears capable of debt repayment, and the opposite case discourages FDI and encourages capital flights.

Political Economy of Institutional Debt: The Bangladesh government's institutional debt has three categories: foreign lenders, domestic banks, and domestic savers such as Sanchaypatra buyers. The third category gets income directly from the fiscal authority, which by-passes the banking system and offers an extremely high nonmarket interest rates on the government saving tools. Among these three categories, foreign loans can be borrowed at a lower interest rate, which can be further lowered if the foreign lenders see a high level of potential growth of the borrowing country. The opposite case will require a higher risk premium.

Given the deceleration in the trend of potential growth, the third category should be considered for cancellation or revision through interest-rate rationalization. Although the government finds raising institutional debt through its direct saving tools politically supportive, the skyrocketing burden of interest through Sanchaypatra is hurting the development budget and contributing to fiscal deficits with an ever-increasing share of Sanchaypatra interest, which may soon become unsustainable. The saving ratio is rising faster than the investment ratio, signaling a challenging future for capital formation. Moreover, since the government is borrowing directly from the public and dampening the growth of the banking sector, the share of public investment is gradually rising in total investment. This trend, in turn, is crowding out private investment and reducing the overall quality of capital formation, which is also contributing to the decelerating trend of potential growth.

In sum, institutional barriers, bureaucratic investment strategies, and suboptimal macro policies arguably have failed to accelerate growth in Bangladesh that other neighboring nations have succeeded in achieving. Hence, the country should expedite or reframe policies to accelerate productivity and capital stock since these two elements can positively impact potential output the most.

8 Conclusion

Deriving potential output growth has remained a challenging area for many developing countries where necessary labor data are often unavailable. In Bangladesh, BBS routinely conducts labor force surveys that generate the data necessary for this purpose. Using time series data from the 1985-2018 period, this study finds that Bangladesh's potential growth has remained around two-percentage points higher than its actual growth. Regime changes have widened the gap between actual and potential growth until the early 2010s because of political disruptions and low investment. The trend of potential growth has also decelerated since the early 2010s due to the declining growth rates of total factor productivity, net capital stock, and labor supply.

While a rising performance gap (difference between the actual growth and potential growth) is undesirable, a dwindling gap may also be a concern depending on how the two lines of potential growth and actual growth progress. It is commendable that Bangladesh's actual output growth has risen during the sample period reducing the performance gap, however, the potential growth has

also begun to sag since the early 2010s, contributing to the gradually narrowing performance gap.

Finally, fiscal and monetary policymaking in Bangladesh appear inadequate to accelerate growth and foster growth promoting strategies. The slowdown of potential growth in recent years poses a number of questions: 1) What potential growth can we expect in coming years at least up to 2025? 2) What policy reforms can be undertaken to promote growth so that output reaches its potential? 3) What roles can the fiscal and monetary policymakers play in promoting both potential and actual growth? These are important questions, which represent avenues of future research.

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Appendix

Table 2: Major Source/Constructed Variables for Calculating Potential Growth.

Year	GDP at 2010	Working Age Population	LFP Rate	Labor Force	Unem. Rate	potential Emp.	work Hours	Labor Supply	LP Index	Net Capital Stock	TFP Index
1985	35,274,979,988	67,200,003	44.21	29,710,422	1.10	28681370	49.54	72,933,296,882	1.00	241,829,546,241	1.00
1986	36,747,139,851	61,930,003	45.04	27,836,694	1.15	29515607	47.83	65,801,362,554	1.02	251,813,972,222	1.02
1987	38,133,389,635	64,907,765	45.87	29,774,057	1.21	30356863	46.04	67,712,475,465	1.04	261,767,230,370	1.03
1988	39,054,790,277	68,171,812	46.70	31,835,418	1.28	31192159	44.36	69,704,290,355	1.06	271,717,375,412	1.05
1989	40,162,611,478	71,600,003	47.53	34,031,445	1.38	31999076	42.87	71946,580,727	1.08	281,761,447,985	1.07
1990	42,420,657,180	71,281,495	48.37	34,477,034	1.49	32757541	41.66	70,738,097,482	1.10	292,059,981,584	1.09
1991	43,899,113,723	70,964,407	49.21	34,920,606	1.63	33463119	40.75	69,989,126,274	1.12	302,837,407,840	1.11
1992	46,288,404,443	70,648,730	50.05	35,357,278	1.80	34123428	40.17	69,74.215,853	1.14	314,378,563,149	1.13
1993	48,469,311,189	70,334,456	50.87	35,780,099	2.00	34754958	39.93	69,954,334,847	1.16	326,999,560,317	1.15
1994	50,354,222,680	70,021,581	51.67	36,181,084	2.22	35390168	39.93	70,636,969,559	1.19	341,029,373,158	1.17
1995	52,933,639,391	69,710,098	52.43	36,552,457	2.46	36024618	40.24	71,731,691,703	1.21	356,799,896,902	1.19
1996	55,327,7135,139	69,400,003	53.15	36,888,171	2.72	36713854	40.78	73,176,664,097	1.23	374,641,696,309	1.22
1997	57,811,945,427	70,570,075	53.82	37,981,677	2.98	37469703	41.52	76,494,744,316	1.25	394,878,788,070	1.24
1998	60,804,285,377	71,759,877	54.44	39,068,903	3.25	38305708	42.38	80,096,105,293	1.27	417,825,454,072	1.27
1999	63,644,568,604	72,969,740	55.03	40,154,827	3.50	39229199	43.29	83,873,361,500	1.29	443,788,165,914	1.30
2000	67,013,463,193	74,200,003	55.59	41,244,823	3.72	40242448	44.18	87,707,599,723	1.31	473,079,327,839	1.33
2001	70,415,929,567	76,337,815	56.12	42,239,629	3.92	41342937	44.97	92,553,372,673	1.32	506,031,403,332	1.36
2002	73,115,059,421	78,537,223	56.62	44,471,517	4.08	42522806	45.63	97,322,593,843	1.33	543,000,723,016	1.39
2003	76,590,396,942	80,800,003	57.10	46,135,551	4.21	43772374	46.12	101,918,422,222	1.34	584,352,840,203	1.42
2004	93,592,852,042	82,047,313	57.53	47,203,311	4.30	45083307	46.44	104,298,927,726	1.35	630,442,101,657	1.46
2005	85,860,356,478	83,313,893	57.92	48,254,674	4.37	46451499	46.62	107,561,736,630	1.36	621583,581,979	1.50
2006	91,588,846,354	84,600,003	58.26	49,284,838	4.42	47873741	46.69	109,965,411,826	1.38	738,027,729,532	1.54
2007	98,053,769,823	87,225,255	58.54	51,062,596	4.46	49343751	46.70	113,911,165,643	1.40	799,956,629,056	1.58
2008	103,950,517,391	29,931,974	58.77	52,856,214	4.47	50847563	46.68	117,243,448,701	1.42	867,474,199,244	1.62
2009	109,194,950,718	92,722,687	58.96	54,665,103	4.48	52365642	46.66	121,231,447,981	1.45	940,582,598,367	1.67
2010	115,279,077,465	95,600,003	59.09	56,489,866	4.47	53874895	46.68	125,939,653,474	1.48	1,019,165,731,311	1.71
2011	122,731,159,566	99,041,304	59.18	58,613,622	4.45	55350739	46.73	130,853,144,655	1.52	1,102,956,172,552	1.76
2012	130,734,992,459	102,606,484	59.24	60,779,460	4.42	56769484	46.84	136,040,955,851	1.56	1,191,507,112,622	1.80
2013	138,596,866,824	106,300,003	59.26	62,994,489	4.38	58113982	46.99	141,542,545,902	1.60	1,284,191,010,290	1.85
2014	146,997,351,292	106,233,291	59.27	62,960,195	4.33	59393327	47.20	142,165,718,909	1.64	1,380,260,499,788	1.89
2015	156,629,549,345	106,166,625	59.26	62,913,306	4.27	60585848	47.44	142,263,021,854	1.69	1,478,909,693,180	1.94
2016	167,771,375,851	106,103,003	59.25	62,861,703	4.21	61756437	47.69	143,591,706,906	1.74	1,579,367,369,245	1.99
2017	179,985,132,013	110,611,256	59.24	65,521,879	4.15	62914399	47.95	350,553,788,864	1.78	1,680,894,951,783	2.04
2018	193,304,031,782	111,785,938	59.22	66,204,948	4.10	64066619	48.20	153,022,122,158	1.83	1,782,847,365,451	2.09

Notes: All data sources and how some of the series were constructed have been discussed in Section 5; GDP, capital stock at 2010 constant USD; LFP = labor force participation; LP = labor productivity;
Unem = unemployment; and Work hours are weekly.