

# Total Factor Productivity in Bangladesh: An Analysis Using Data from 1981-2014

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**BIDS RESEARCH  
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**2017**

# Background

- Bangladesh joined the lower middle income countries club in 2015 attaining \$1080 per capita GNI crossing the threshold of \$1045.
- The target of Bangladesh is now to smoothly transit from lower middle income to upper middle income country.
- Bangladesh is targeting to achieve the growth rate of 8% per annum by 2021(7<sup>th</sup> Five Year Plan) and there is an expectation from policy makers to elevate to High Income Country Status by 2041
- Bangladesh is one of the sixteen countries that has to strive for a journey to get herself out of LDC and at the same time to secure the middle income status (WDI 2016 database).

# Background

- The current pattern of growth identifies Factor Accumulation to be the driver of growth during the period 1981-2014. If this pattern continues, very soon capital and labor will exhibit diminishing returns and the economy will then experience fall in growth rates.
- Hence, Bangladesh may be exposed to the potential risks of middle-income trap and jobless growth (the case of Philippine) unless the present pattern of growth is not reversed.

# Objectives

- Estimate the Total Factor Productivity of Bangladesh (1981 to 2014) and
- Analyze it's main determinants
- The study reveals :
  - Issues regarding the low (Negative) TFP growth
  - What would happen in the future if the current growth pattern is not reversed (possible falling into Middle Income Trap)

# What is TFP?

- It is the portion of output not explained by the amount of inputs used in production processes.
- Its level is determined by how efficiently and intensely the inputs are utilized in production process.
- It plays a critical role on economic fluctuations, economic growth and cross-country per capita income differences.
- Cross-country differences in income levels and growth rates are mostly due to differences in productivity (Klenow and Rodriguez-Clare 1997; Easterly and Levine 2000).
- A majority of the gap in income per capita between rich and poor countries is associated to large cross-country differences in TFP (Hall and Jones ,1999).
- Cross-country differences in TFP is due to differences in the physical technology used by countries or the efficiency with which technologies are used.
- In-fact, cross-country differences in technology are approximately four times larger than cross-country differences in income per capita ( Comin, Hobijn and Rovito,2006).
- Hence, cross-country variation in TFP is, to a large extent, determined by the cross-country variation in physical technology.

# Estimating TFP

- TFP is estimated using a Cobb-Douglas production function in which **GDP (Y)** is assumed to be produced by using two factors, **physical capital (K)** and **human-capital-adjusted labor input (HL)**.

$$Y_t = A_t K_t^\alpha (H_t * L_t)^\beta$$

# Data Source

Data	Source
GDP value and Capital stock	BBS at 1995-96 base prices in million taka
The Human Capital Index	Barro-Lee database
The number of employed persons	Penn Table database
Government Expenditure on Schooling (as % of GDP)	World Development Indicators
Broad Money (as % of GDP)	
Government Consumption( as % of GDP)	
Inflation Deflator	
Remittance (as % of GDP)	
Globalization Index data	KOF database
Data on Voice and Accountability, Rule of Law, Regulatory control	World Governance Indicator dataset

# Table 1: Estimates of the Cobb-Douglas Production Function

Production Function Form	Aggregate Production Function			Intensive Form Production function	
	$Y_t = A_t K_t^\alpha (H_t * L_t)^\beta$			$y_t = A_t k_t^\alpha$	
Method	Intercept	$\alpha$	$\beta$	Intercept	$\alpha$
OLS at First difference	-0.06 (0.67) [0.51]	0.684* (7.49) [0.000]	0.299** (2.23) [0.03]	-0.007 (4.33) [0.000]	0.689* (10.96) [0.000]
Vector Error Correction (VEC)	2.47	<b>0.493*</b> (7.43)	0.527** (4.56)	-2.18	0.47* (14.50)
Fully Modified Least Squares (FMOLS)	1.65 (2.88) [0.07]	0.699* (14.21) [0.000]	0.121*** (1.66) [0.10]	-0.007 (3.22) [0.003]	0.699* (8.76) [0.000]
ARDL (Bounds Test)	0.06 (0.05) [0.96]	0.654* (8.20) [0.000]	0.255*** (1.85) [0.07]	-0.007 (2.80) [0.009]	<b>0.709*</b> (7.69) [0.000]

Values inside the parenthesis and bracket indicate t-values and P-values respectively.

\*, \*\* and \*\*\* indicate significant level at 1%, 5% and 10% respectively.

=>This study makes assumption of both CRS (Constant Return to Scale) and Non-CRS in Aggregate Production Function and CRS assumption in Intensive form. Thus, these 3 cases when estimated with the 4 techniques will yield **12 series of TFP**, which is done only to check for Robustness.

# Table 2: Growth Accounting Framework

				Intensive Form Production Function			
	Mean	Mean	Mean	OLS	VEC	FMOLS	ARDL
Growth due to-	$\Delta \ln Y$	$\Delta \ln K$	$\Delta \ln(L+HK)$	TFP	TFP	TFP	TFP
<b>1981-2014</b>	<b>4.89</b>	<b>6.12</b>	<b>3.17</b>	-13.67	-6.12	-14.01	<b>-14.36</b>
<b>1981-1990</b>	3.65	4.21	3.85	-22.17	-26.97	-21.96	-21.74
<b>1991-2000</b>	4.69	6.00	2.86	-14.75	-5.44	-15.18	-15.60
<b>2001-2010</b>	5.66	7.36	3.05	-13.65	-2.13	-14.17	-14.70
<b>2011-2014</b>	5.98	7.31	2.75	-5.14	6.85	-5.69	-6.24

	Aggregate Production Function							
	CRS assumption				Non-CRS assumption			
	OLS	VEC	FMOLS	ARDL	OLS	VEC	FMOLS	ARDL
Growth due to-	TFP	TFP	TFP	TFP	TFP	TFP	TFP	TFP
<b>1981-2014</b>	-13.50	-6.91	-14.01	-12.46	-11.97	-8.71	<b>2.16</b>	-4.28
<b>1981-1990</b>	-22.28	-26.46	-21.96	-22.94	-19.95	-29.21	2.74	-10.45
<b>1991-2000</b>	-14.54	-6.42	-15.18	-13.26	-13.09	-8.13	0.20	-5.49
<b>2001-2010</b>	-13.38	-3.34	-14.17	-11.80	-12.07	-4.89	-0.24	-4.76
<b>2011-2014</b>	-4.87	5.59	-5.69	-3.22	-3.72	4.24	6.43	2.90

Where **Y=Output**; **K=Capital**; **L\*HK= Effective Labor**

# Determinants of TFP

$$\begin{aligned} TFP_t = & \alpha_0 + \alpha_1 D. Govt. Expenditure on Schooling_t + \\ & \alpha_2 D. Voice and Accountability_t + \alpha_3 D. Regulatory Control_t + \\ & \alpha_4 D. Rule of Law_t + \alpha_5 D. Broad Money_t + \alpha_6 D. Govt. Consumption_t + \\ & \alpha_7 Inflation Deflator_t + \alpha_8 D. Remittance_t + \alpha_9 D. Globalization Index_t + \varepsilon_t \end{aligned}$$

# Determinants of TFP

- The role of TFP in the context of Bangladesh remains drooping.
- A mix of institutional quality indicator variables and macro variables have been tested to determine the TFP in Bangladesh.
- Six of the variables are found to be significantly affecting the TFP in Bangladesh.
  - Government Expenditure on Schooling significantly positively influences the TFP in Bangladesh.
  - Besides, ensuring Voice and Accountability also increases TFP.
  - The impact of Remittance on TFP is found to be negative but not statistically significant. The negative relation emerges from the fact that households spend mostly on current consumption instead of investing a part of it for future consumption.
  - This study finds the negative impact of inflation on TFP as the sign is expected. Besides, imposing regulatory control may also adversely affect the TFP.

# Table 3: Determinants of TFP

Model	Non- CRS assumption (Aggregate)_OLS	CRS assumption (Aggregate)_FMOLS	CRS assumption (Intensive)_ARDL
<b>VARIABLES</b>	TFP	TFP	TFP
<b>Government Total Expenditure on Education (% of GDP)</b>	0.0377***	0.0379***	0.0381***
	-0.013	-0.013	-0.013
<b>Voice and Accountability</b>	0.0686***	0.0683***	0.0672***
	-0.021	-0.021	-0.021
<b>Regulatory Control</b>	-0.0687**	-0.0674**	-0.0657**
	-0.025	-0.025	-0.025
<b>Broad Money (% of GDP)</b>	-0.00159**	-0.00158**	-0.00155**
	-0.001	-0.001	-0.001
<b>Inflation Deflator</b>	-0.000935**	-0.000926**	-0.000910**
	-0.0004	-0.0004	-0.0004
<b>Globalization Index</b>	-0.00272**	-0.00272**	-0.00276**
	-0.00102	-0.00102	-0.00103
<b>R-squared</b>	0.513	0.512	0.507

Abridged Results: Out of the 12 models only the results of three models are reported here.

# Determinants of TFP

- The impact of **Globalization** on the TFP of Bangladesh is found to be significantly negative.
- This raises the question whether Bangladesh took appropriate measures to tackle the adverse impact of it or whether Bangladesh was ready to face the challenges exposed by TFP ?
- In essence, keeping abreast with the pace of globalization, Bangladesh should have diversified its export baskets rather it has concentrated its export basket even in a single digit number.
- The countries that have attained upper middle-income (i.e., that jumped from lower middle-income) status, in general, had more diversified, sophisticated, and nonstandard export baskets at the time they were about to make the jump than the countries stuck in the middle-income trap today ( Felipe, J. 2012).

# Determinants of TFP

- **Broad money** as a percentage of GDP is used as a proxy for financial development. It is quite disappointing that increase in the share of broad money as a percentage of GDP exert negative influence on the TFP in Bangladesh. This indicates the immature financial sector development in Bangladesh.
- The Central Bank is increasing money supply in one hand, the amount of Idle money is piling up on the other side. According to Bangladesh Bank, there is more than Tk 1.16 trillion totally unused in the country's banks and financial institutions which day by day is increasing (up to August, 2017).
- In sum, improvement in **institutional quality** (captured by voice and accountability and regulatory control from the government side) and **investing in human capital** (increasing spending on education) are a must for Bangladesh to increase or facilitate its long run growth rate through augmenting the role of TFP.

# Policy Suggestions

- Strategies that Bangladesh should adopt to be in the club of upper middle income countries at the shortest possible time through increasing TFP include:
  - ❖ Investment in Human Capital
  - ❖ Good governance, reforming public administration, strong quality institutions, ensuring voice and accountability and minimizing the regulatory control
  - ❖ Investment in R&D

# Conclusion

- Since the economy is now accustomed to grow over 6% per year it is high time Bangladesh should prepare itself by **investing in human capital and adopting newer technologies**, to sustain the growth through the increased role of TFP.

Thank You