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February 15, 2022

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CONTENTS

ADDRESSING CLIMATE CHALLENGES IN BANGLADESH: A SMART CARBON PRICING STRATEGY: A CARBON USER FEE TO MOBILIZE CLIMATE FINANCE[1]

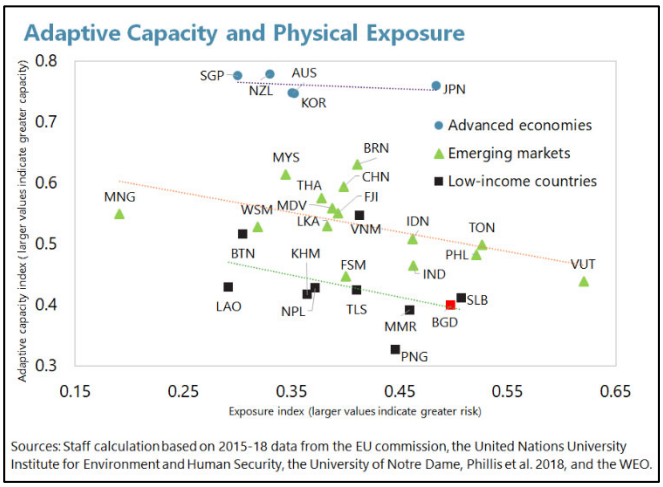
Summary: *Climate change will pose critical macro-economic challenges for Bangladesh in the coming decades. Bangladesh is one of the most active countries in terms of planning and acting on climate change. Tackling climate change will require a mix of fiscal, financial and structural policy interventions. In this note, we explore the critical challenges facing Bangladesh in its pursuit to build climate-resilience and transition to a low-carbon economy, including lack of access to financing on favorable terms and explore the benefits of a gradual adoption of a carbon user fee before FY 25 per the 8th Five Year Plan (FYP). With the early adoption of carbon pricing, Bangladesh will provide a strong and credible signal to donors and investors on its commitment to a greener economy by meeting the 2021 Nationally Determined Contributions (NDC) mitigation targets. The fee will be easily implementable as it will fall narrowly on the energy sector and will increase gradually from US$3 per metric ton of CO2 in FY22 to US$25 per metric ton of CO2 in FY 30, helping firms to plan ahead for decarbonizing their production processes and improving energy efficiency, thereby reducing stranded assets, risks to competitiveness, and job losses in the future. A carbon fee in Bangladesh will also help with revenue mobilization that could be effectively recycled to protect the economically vulnerable, support firms in their decarbonization process, and create jobs through investment in climate projects. Finally, carbon pricing could also help negotiate better terms for prospective border carbon adjustments (BCAs) abroad and/or more favorable trade deals in the run up to LDC graduation. "The simplicity of a price signal is preferable to an approach that requires a complex case-by-case evaluation of the climate impacts of every individual project" (OECD 2021). This may be an opportune time for Bangladesh to align with interests and net-zero goals of its export consumers, donors, and the private investors following the renewed pledges at COP26.*

A. Context

1. Bangladesh is extremely vulnerable to climate change. Bangladesh is ranked among the top ten countries in the world most affected by extreme weather events during 1998–2017 (Global Climate Risk Index). Losses linked to such events were estimated annually to average 1.8 percent of GDP between 1990 and 2008 (IMF 2019b). In addition, rising sea levels and coastal erosion is expected to result in a significant loss of land surface, food production and displacement of people. Not only Bangladesh is highly exposed to climate change risks, but also has limited adaptive capacity to cope with these risks (text figure). Bangladesh is the 27th most vulnerable country and the 26th least ready country (Notre Dame's Global Adaptation Initiative Index). With increasing sea

[1] Prepared by Ritu Basu, Jayendu De, Biying Zhu (all APD), and Vybhavi Balasundharam (FAD).

levels, abrupt changes and variability in monsoon rain, gradual rise in temperatures and more frequent natural disasters, Bangladesh, a densely populated delta, has an urgent need to build its adaptive capacity. The government should start monitoring and planning interventions in line with the long-term Delta Plan and the 8th five year plan, focusing on building adaptive infrastructure (e.g., dikes, barriers etc.) while supporting new, climate resilient jobs in agriculture and skill development to allow diversification into other sectors; investing in nature-based solutions (e.g., mangrove forests, natural dunes, beach replenishment); and being pro-active in land-use -planning. Importantly, the government should seek out concessional finance, to the extent possible, to support such investments to ensure macro and fiscal sustainability and a robust post pandemic recovery.



Sources: Staff calculation based on 2015-18 data from the EU commission, the United Nations University Institute for Environment and Human Security, the University of Notre Dame, Phillis et al. 2018, and the WEO.

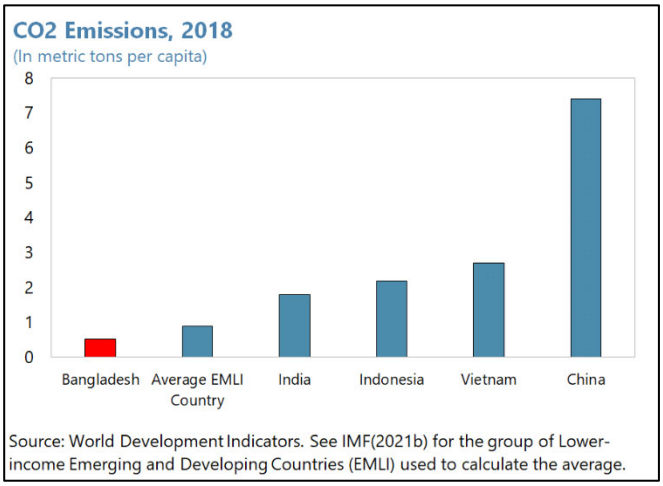
2. Bangladesh is in many ways at the forefront of preparing for climate change.[2]

Bangladesh is one of the few countries in the world to have operationalized the Climate Fiscal Framework (CFF), which provides the principles and tools for climate fiscal policy making. It helps to identify the demand and supply sides of climate fiscal funds, and to ensure that the use of these funds is transparent and sustainable in the longer term. Bangladesh adopted climate change budget tagging in 2018 and publishes citizen climate budget annually. It has also identified and costed an extensive pipeline of adaptation projects through its Delta Plan 2100 and is currently working on the Mujib Climate Prosperity Plan 2030, a strategic investment framework to mobilize financing.[3] Meanwhile, the Bangladesh Bank (BB) has developed a Sustainable Finance Policy for Banks and Financial Institutions and a green taxonomy to classify economic activities based on their contribution to sustainability and climate change objectives. BB has also put policies in place to promote green financing.

[2] See World Bank (2021) for a review of the country experiences using these planning tools.

[3] "The draft Mujib Climate Prosperity Plan, aims at mobilizing financing, primarily through international cooperation, for implementing climate resilience initiatives such as an expansion of locally-led adaptation, the establishment of carbon market regime, Bangladesh Delta Plan 2100 resilience bonds, climate-resilient and nature-based agricultural and fisheries development, climate resilient well-being programs and accelerated digital revolution, training and skills development." (MOEFCC 2020).

3. Bangladesh is also contributing to the global efforts to combat climate change. Bangladesh accounts for less than 0.35 percent of global greenhouse gas (GHG) emissions, with per capita emissions significantly lower than many countries in the region (text figure). It has proposed an unconditional aggregate reduction of GHG emissions by 6.73 percent below Business-As-Usual (BAU) levels by 2030, shared between the Energy, Industrial Processes & Product Use (IPPU), Agriculture, Forestry and other Land use (AFOLU) and Waste sectors in its updated nationally determined contributions (NDCs, MOEFCC b 2021).[4] Its proposed conditional contribution is to reduce GHG emissions by an additional 15.12 percent below BAU levels by 2030. While Bangladesh is a lower-than-average per capita emitter amongst Low Income Emerging and Developing countries (LIDCs), it's pledge on mitigation is substantially higher than the average for LIDCs at 4 percent below BAU in 2030 (IMF 2021b). In its Eighth Five Year Plan (8th FYP), Bangladesh has proposed a carbon tax of 5 percent of energy prices by 2025 to help achieve these emissions target.



Source: World Development Indicators. See IMF(2021b) for the group of Lower-income Emerging and Developing Countries (EMLI) used to calculate the average.

4. Bangladesh faces key constraints to achieving its climate goals. Progress in resilience and adaptation to climate change has been prioritized but remains insufficient to meet the significant needs. The large adaptation needs can be accelerated by relaxing financing constraints, creating fiscal space for enabling new investments, and enhancing access to technology. It will also involve addressing macro critical structural constraints such as modernizing financial sector and strengthening investment climate. Progress in climate mitigation could be stepped up with international partner support.

Financing: The World Bank estimates that Bangladesh would need US$5.7 billion per year as adaptation finance by 2050 (MOEFCC b), more than 5 times higher than its current expenditure of around US$1 billion a year on climate change adaptation (CCA).[5] In fact, total climate relevant budgetary allocations (for both mitigation and adaption) has been less than 1 percent of GDP annually, well below the 3-4 percent of GDP needed per year for climate and biodiversity

[4] In the GHG emission reduction scenario presented in the updated NDC document, majority of the planned reduction is from the energy sector (about 95.5 percent in the unconditional scenario and 96.1 percent in the conditional scenario), with the remaining burden shared between the AFOLU and Waste sectors. For our study in 2030 the BAU emission level is expected to be 136 metric tons (as specified in the CPAT) and starting at 97 metric tons in 2021. The reduction in emissions in 2030 when mapping the NDC unconditional (conditional) commitments would mean a 6.73 percent (21.85 percent) unconditional (conditional) reduction from 136 metric ton of emissions.

[5] As reported in the 2021 updated NDC document. As per the estimates of the Bangladesh authorities, costs for mitigation are estimated at about US$27 billion (FY2011-30), which translates to about US$1.4 billion per year for mitigation. Costs for the effective implementation of Nationally Determined Contribution (NDC) for adaptation (over FY15-30) have been estimated at about US$ 42 billion, which translates to about US$2.8 billion annually.

preservation mandated by the SDG goals. Adaptation investments, which are expected to be met through a combination of domestic and external funding, are significantly higher than mitigation investments. There can be no adaptation without finance.

Fiscal Space: Bangladesh seems to have limited fiscal space – especially post-COVID-19, making it challenging to deal with frequent natural disasters and to accommodate large scale, and costly climate resilient investment. At less than 10 percent, Bangladesh's tax revenue-to-GDP ratio remains low, further constraining the government's ability to increase social, climate and developmental spending, and build adaptive capacity. In addition, with depletion of domestic natural gas reserves and rising fuel prices, Bangladesh faces upward pressures on energy subsidy spending, potentially diverting resources from other development needs. Furthermore, as debt vulnerabilities have increased with the COVID-19 pandemic, Bangladesh needs to focus on concessional financing and non-debt creating flows (such as FDI) to achieve the goals laid out in the 8th FYP and Delta Plan. Adaptation will not be fiscally sustainable without expanding the net-tax base.

Technology: Investment in resilient infrastructure and low-carbon technologies is costly. Active support from international partners on the development, transfer, and industrial-scale deployment of technologies would be critical for a transition to a green economy (World Bank 2020). Equally, investment in renewables such as wind, biomass, biogas, solar mini grid, waste to electricity (see updated NDC 2021), as well as preservation of natural capital, investment in waterways, mangroves and coastal areas protection as laid out in the 8th FYP and Delta plan, can help with both adaptation (a natural sea-wall) and mitigation (a natural carbon sink).

Distributional Consequences and Risks to a Just Transition: Climate change disproportionally affects the poor and exacerbates inequalities, ultimately undermining development and poverty eradication efforts. Poorly designed climate policies risk amplifying existing inequalities. Adaptation policies should ensure an equitable allocation of limited resources, and mitigation policies should compensate the vulnerable for the burden from higher energy prices and investment in new skills. A just transition must create jobs and foster equality.

Bangladesh has other macro-critical economic challenges that will have implications for its resource and climate goals and appropriate climate policy interventions could also help deal with them.

Prepare for the LDC Graduation: As Bangladesh graduates from LDC status in 2024, now postponed to 2026, it is expected to lose its preferential tariff status in the EU. In addition, climate funds, such as the Green Climate Fund and Global Environment Facility, prioritize financing for LDCs, and although small, Bangladesh could lose access to such concessional climate financing after LDC graduation. It is therefore imperative for Bangladesh to negotiate new international support mechanism and look for alternative sources of climate funds (Rahman and Bhattacharya 2020).

Enhance Export Competitiveness: As Bangladesh looks to diversify its exports, concerted efforts on climate mitigation and adaptation could be critical for supporting Bangladesh's international competitiveness. Trends in export demand and capital flows are increasingly based on trade and investment partners' compliance with environmental standards and greener production processes as

well as broader ESG (environment social and governance) considerations. The need to decarbonize the supply chains is becoming even more urgent as EU is expected to introduce Border Carbon Adjustments (BCAs) in 2023 that would require importers to pay an import tax or purchase emissions allowance on highly energy intensive products from countries that do not have comparable emissions pricing requirement. This would place Bangladesh's export firms at a disadvantage in the EU and could appropriate government revenues at Bangladesh's expense.

Underdeveloped Financial Markets. In April 2021, Bangladesh Securities and Exchange Commission (BSEC) approved the first green bonds in Bangladesh, for SAJIDA, a non-governmental organization, to raise Tk 1.0 billion from the capital market. However, the scope for financial instruments such as green bonds, catastrophe bonds are limited in Bangladesh as the capital market remains shallow. More broadly, financial sector reforms to tackle nonperforming loans stock and flows and improving corporate governance remain imperative for capital market development.

5. Bangladesh has already invoked a mix of policy tools but more is needed in moving the implementation forward (Table 1). On adaptation, Bangladesh is lagging on post disaster resilience and has inadequate resources for building resilient infrastructure. On mitigation, it has primarily focused on non-price instruments such as promoting green financing, adopting PFM measures such as climate change budget tagging, and focusing on conservation. There are a range of policy options available within Bangladesh's constraints.

Table 1. Bangladesh: Climate Policy Tools

Fiscal	Financial	Institutional
Climate Fiscal Framework (2014)	Sustainable Finance Policy/Green Taxonomy (2020)	Bangladesh Delta Plan (2018)
Climate Change Trust Fund (2010)	Securing climate financing	8th Five Year Plan (2020)
Climate Change Budget Tagging (2018)	Initiating Green Bond issuances (2021)	Disaster Management Act (2012)
Carbon fee/ETS/Feebates	Risk insurance, Cat bonds, Contingency credit lines	Bangladesh Climate Change Strategy and Action Plan (2009)
Contingency/Reserve Funds	Intergrating climate risks into financial sector supervision	Mujib Climate Prosperity Plan
		National Adaptation Plan

Note: Green indicates policy tools already implemented or in progress in Bangladesh. Black indicates tools for consideration. Source: IMF staff based on the review of various official documents produced by the Bangladesh Government, World Bank (2021), IMF country report no.19/300.

Structural: Reforms to improve governance and the investment climate, including continued liberalization of FX regulations, a review and adaptation of the regulatory framework to be more supportive of trade and outward FDI, and further legal reforms, such as in land registration and contract enforcement, would encourage more FDI and domestic investment in emerging green sectors and resilience building. Investments in skill development and reskilling the workforce would be essential to diversify the export base and accelerate the transition to a low-carbon economy. Strengthening regulations on resilient building codes, vehicle emissions codes, fertilizer use etc. will help Bangladesh attain its climate goals in various sectors (IMF 2021a).

Fiscal: Bangladesh can strengthen its post-disaster resilience by introducing a dedicated contingency line in the national budget that would be geared more specifically at crisis management and emergency relief efforts in the event of severe flooding or droughts. Unused funds could be placed in a natural disaster reserve fund with strict governance and transparency requirements (IMF 2019b). With regards to mitigation, Bangladesh aims to reduce its fossil fuel subsidies and establish a carbon tax as noted in its 8th FYP. Non-tax incentives such as feebates and Emissions trading Systems (ETS), and other tax incentives such as accelerated depreciation, investment tax credits can usefully complement these measures to accelerate development and adoption of green technologies (IMF 2021a).[6]

Financial: To further strengthen post-disaster resilience, Bangladesh could consider risk-sharing instruments such as catastrophe bonds and parametric disaster insurances, as well as pre-arrange financing like the CAT DDO (IMF 2019b).[7] The National Security Certificate (NSC) pricing reforms would deepen the government bond market. Further efforts to promote green financing could usefully focus on better integrating environmental risks in financial sector supervision and specifically promoting financing for climate-resilience building. The effectiveness of green taxonomy could be enhanced by unifying the framework that currently is only applied on domestic capital markets to cross-border financing as well.

After broad recommendations, the next section explores the potential catalytic role of a carbon fee to attract finance (including FDI), by signaling a strong commitment to Bangladesh's NDC mitigation goals, and its potential as a complementary tool to facilitate distribution, adaptation, and development goals.

[6] Under Emissions Trading Systems (ETSs), firms can trade their allowances for CO2 emissions at market prices and the government sets a ceiling on total allowances or emissions. ETSs are more widely used in the Asia and Pacific region compared to carbon taxes. However, ETS is generally less effective at reducing CO2 emissions due to free allowances, narrower coverage and uncertain effects on energy prices, and would therefore constitute only a second-best approach for advancing mitigation efforts. IMF (2019a) estimates that ETS can only achieve around three-fifths of the CO2 reductions from a carbon tax at $70 per metric (mt) ton for Bangladesh.

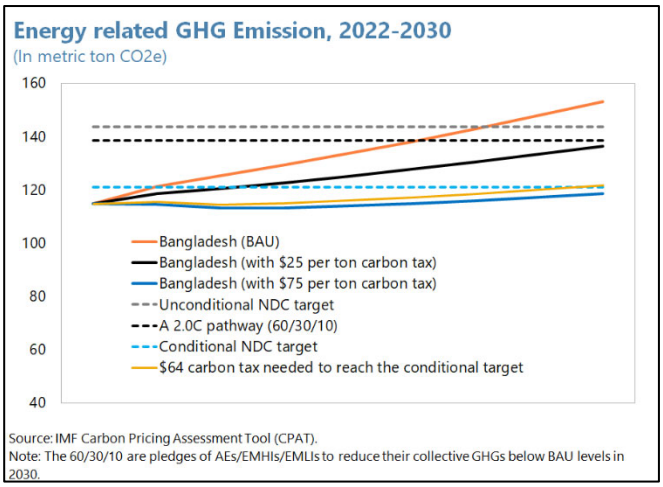
[7] Examples include Sri Lanka's national natural disaster insurance scheme (NNDIS), a public insurance program launched in 2016 by the Sri Lanka government and Caribbean Catastrophe Risk Insurance Facility, a multi-country risk pool providing disaster risk insurance for Caribbean countries.

B. Considering an Early Adoption of Carbon Pricing to Mobilize Climate Finance

"Bangladesh PM Hasina tells rich world to fulfil carbon pledges," Reuters, November 1, 2021

"Being part of the solution requires all providers of development co-operation to align their activities with the objectives of the Paris Agreement. However, many still lack the mandates, resources, incentives and strategies to do so." (OECD 2019). "Carbon pricing can facilitate such an alignment as the price signals sent by carbon pricing can help to ensure that aid flows into Paris-compatible projects."(OECD 2021).

6. The introduction of a carbon user fee on the energy sector could be a highly effective measure to reduce CO2 emissions in Bangladesh.[8] Gradually implementing a moderate carbon fee starting at US$3 per mt. ton of CO2 on the energy and IPPU sectors in 2022, and increasing to US$25 per mt. ton by 2030 could reduce CO2 emissions by 12 percent by 2030, exceeding Bangladesh's 6.73 percent unconditional updated NDC target (text figure). Assuming Advanced Economies (AEs) and Higher-Income Emerging and Developing Countries (EMHIs) reduce their emissions by 60 and 30 percent respectively, and other Lower-Income Emerging and Developing Countries (EMLIs) reduce their emissions by 10 percent, a US$25 carbon fee for Bangladesh would also be consistent with the global collective target of keeping warming to 2C (See IMF 2021b for details on this global scenario). The US$25 carbon fee is IMF's proposal for an International carbon price floor (ICPF) for low-income countries (LICs) in consideration of international equity and competitiveness (IMF 2021c). To reach the conditional target of an additional 15.12 reduction, Bangladesh would require a carbon fee of US$64, and would need sufficient compensation mechanisms to offset distributional impacts such as job loss or loss of competitiveness.



Source: IMF Carbon Pricing Assessment Tool (CPAT).
Note: The 60/30/10 are pledges of AEs/EMHIs/EMLIs to reduce their collective GHGs below BAU levels in 2030.

7. A Carbon user fee can raise additional and predictable fiscal revenue to achieve adaptation goals and pay for just transition costs. A US$25 carbon fee on the energy sector can bring a gradual increase in additional revenue, amounting to 0.48 percent of GDP on an annual basis

[8] It is assumed that non-energy sectors emissions reduction is tackled through non-tax interventions. The estimates on impact of carbon taxes on emissions, revenue, costs and net welfare benefits are from the Carbon Pricing Assessment Tool (CPAT). We assume a linear increase in carbon tax starting in 2022 and with no exemptions on sectors. The carbon tax is applied on all commercial energy sources, including, natural gas, petroleum, coal, electricity, kerosene, and gasoline. CPAT incorporates assumptions on economic growth (IMF WEO), population growth, energy mix changes based on the authorities' energy plans, autonomous and endogenous efficiency improvements in energy-consuming capital, and existing fossil fuel subsides in its calculations.

by 2030, about a 5 percent increase in the revenue base (Table 2). Given that Bangladesh already has an established fuel tax system, the fee would be relatively easy to administer. A carbon fee could also improve the efficiency and revenue yield of the tax system as tax evasion is harder. Also, when revenues from the carbon fee are used to lower other distortionary taxes such as labor or production taxes, it can help to shift the tax mix away from taxes that are only paid by the formal sector, lowering the relative tax burden of the formal sector and reducing the incentives for informality (Timilsina and others 2021). Finally, additional revenue from the carbon fee could be earmarked for promoting domestic equity and transition to a greener economy.[9] For example, revenues from India's coal "cess", implemented in 2010 at INR 50 per ton of coal imported or produced domestically and gradually increased to the current rate of INR 400 per ton (equivalent to a carbon tax of US$2 per mt. ton CO2), have been allocated to the National Clean Environment Fund (NCEF) to finance clean energy technologies and related projects (Sumarno and Laan 2021).

Table 2. Bangladesh: Impact of Carbon Fee, 2030

CO2 Emission Reduction			
Carbon Fee per ton of CO2	$25	$50	$75
Reduction below 2030 Baseline	12%	19%	24%
Domestic Environmental Benefits			
	$25	$50	$75
Economic Cost (In percent of GDP)	-0.07	-0.2	-0.4
Gross Benefit (In percent of GDP)	0.32	0.5	0.7
Net Benefit (In percent of GDP)	0.255	0.3	0.3
Revenue			
Carbon Fee per ton of CO2	$25	$50	$75
In percent of GDP	0.483	0.89	1.24
Energy Price Increase			
Baseline Price	$25	$50	$75
Coal ($2.47 per GJ)	101%	202%	304%
Natural Gas ($5.66 per GJ)	27%	54%	81%
Electricity ($0.22 per kwh)	19%	36%	51%
Gasoline ($1.42 per liter)	5%	9%	14%

Source: IMF Carbon Pricing Assessment Tool.

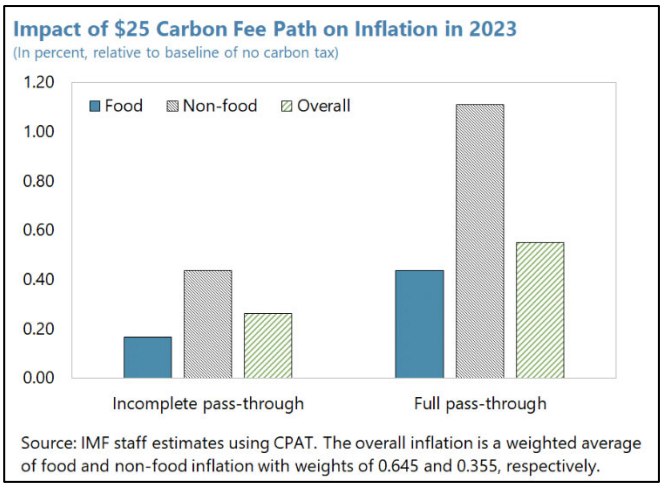
8. Domestic environmental benefits from reduced pollution among other impacts, would outweigh the economic costs of carbon pricing. High levels of pollution in Bangladesh reduce human welfare, labor productivity and labor supply. Estimated losses linked to urban pollution and environmental degradation in Bangladesh is close to three percent of GDP (World Bank 2018). The gross national monetized welfare benefits including the health and mortality related environmental co-benefits from a US$25 carbon fee could reach to about 0.32 percent of GDP, more than covering

[9] IMF (2021a) shows that even universal transfers that distribute carbon tax revenues equally to the population could make the majority of households, including poor ones, better off.

the total economic costs from a decline in overall economic activity due to higher energy prices and generating a net benefit of 0.26 percent of GDP by 2030.[10]

9. Despite the urgency to build back better post pandemic and pledges made towards net-zero emissions by mid-century, governments are wary of the political costs of enacting market-based measures such as a carbon user fee on fossil fuels (Furceri et al. 2021). Foremost among the challenges are the cost of being the first mover, in terms of equity considerations as well as plausible adverse impact on prices and competitiveness, the scale and scope of coverage, and available non-price options to reduce emissions. Bangladesh seems to be well positioned to handle these challenges, especially if implementation of a carbon fee is able to catalyze the needed finance.

10. The impact on prices and inflation from the phased-in carbon pricing is likely to be small. A gradual introduction of carbon fee starting at US$3 per mt. ton of CO2 emission in FY 22 scaling up to US$ 25 per mt. ton of CO2 emission by 2030, will have very little impact on food prices and overall inflation. Assuming full-pass-through, a US$3 increase in carbon fee per year would translate to an increase in food-price inflation of around 0.2 percent and non-food inflation of around 1.1 percent in 2023, resulting in an overall inflation of around 0.5 percent. Incomplete pass-through would further reduce the impact of carbon pricing on inflation.



11. Carbon pricing is likely to result in limited aggregate job losses due to minimal cost increases in most manufacturing sectors. For example, a US$25 carbon fee can raise the input cost of manufacturing of other nonmetallic minerals by 6 percent, which is the highest among all the downstream sectors.[11] Other downstream sectors appear to be not very sensitive to carbon taxes, especially industries that have large shares in exports such as textiles and textile products. Because Bangladesh's labor force is also concentrated in less carbon-intensive industries, the jobs at risk from carbon pricing could be manageable with appropriate compensatory measures. By IMF staff estimates, the aggregate jobs at risk in the manufacturing industries is around 1 percent of employment (Table 3). These estimates are likely an upper bound as they do not account for growth of new green sectors, revenue recycling, and endogenous efficiency responses that could mitigate

[10] The economic costs include losses in consumer surplus from lower energy consumption and higher costs to produce cleaner energy, less net revenue gains to the government (accounting for the erosion of pre-existing fuel tax bases). Net revenue gains from carbon fees would be attenuated if existing fuel subsidies increase simultaneously. See Appendix III in IMF (2019a) for details.

[11] A carbon fee affects downstream industries by directly by raising the price of energy and indirectly through driving up costs and prices for intermediate inputs in general. The indirect cost effects are estimated by assuming full pass-through of the burden from upstream energy and intermediate inputs producers to downstream producers using the GTAP Input-Output tables.

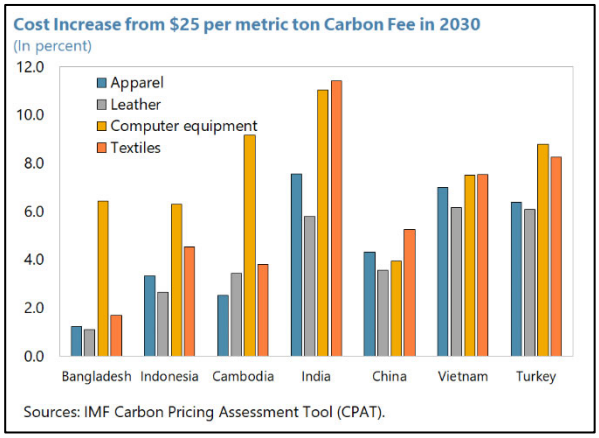
the impact on jobs.[12] Existing evidence points to a typically small and indeterminate effects on aggregate jobs, depending on the extent of substitution between high- and low-emission activities (IMF 2020). However, it is important to compensate the poor through targeted, short-term transition assistance, and dislocated workers through vocational training programs and to re-skill the workforce for new industries and job search assistance.

Table 3. Bangladesh: Cost Increase and Jobs at Risk in Manufacturing

Industry	Cost Increase by Carbon Fee (In percent)			Medium-term Jobs at Risk (In percent of total employment)		
	$25/mtCO2e	$50/mtCO2e	$75/mtCO2e	$25/mtCO2e	$50/mtCO2e	$75/mtCO2e
Nonmetallic minerals	6.22	12.21	18.07	0.58	1.15	1.70
Textiles and textile products	1.35	2.62	3.85	0.21	0.42	0.61
Chemicals, chemical products and other manufacturing	11.95	22.98	33.48	0.10	0.19	0.28
Basic metals and fabricated metal	2.65	5.02	7.22	0.09	0.16	0.24
Food, beverages, and tobacco	1.10	2.16	3.19	0.08	0.15	0.22
Rubber and plastics	9.18	17.88	26.30	0.07	0.14	0.21
Pulp, paper, paper products, printing, and publishing	4.69	9.05	13.20	0.06	0.12	0.18
Electrical and optical equipment	2.57	4.79	6.80	0.02	0.04	0.06
Leather, leather products, and footwear	1.11	2.17	3.19	0.02	0.03	0.05
Machinery, nec	2.32	4.32	6.14	0.01	0.02	0.03
Transport equipment	1.88	3.71	5.51	0.01	0.02	0.02
Wood and products of wood and cork	2.14	4.14	6.05	0.00	0.01	0.01
Coke, refined petroleum, and nuclear fuel	10.08	19.37	23.58	0.00	0.01	0.01
Total				**1.27**	**2.46**	**3.62**

Source: Carbon Pricing Assessment Tool; ADB IO table; IMF staff estimates using the employment data from UNIDO database. See IMF (2021a) for details on the methodology.

12. Bangladesh would be able to maintain its export competitiveness with a carbon fee under the assumption of low carbon intensive energy use.[13] Looking at the estimated cost increases from a US$25 per mt. ton carbon fee on the apparel and textiles industry e.g., across major exporters in the world in (text chart), Bangladesh has the lowest projected cost increase at less than 2 percent by 2030. Additionally, many sectors that Bangladesh would like to diversify to, such as leather and computer products will remain competitive. The relatively benign cost impacts of carbon pricing are primarily a result of Bangladesh's energy mix – its primary energy source, natural gas, is a less carbon intensive fuel than coal that is the primary energy source in



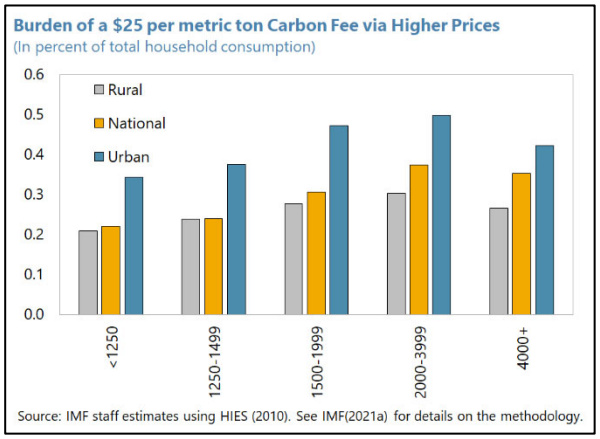
Sources: IMF Carbon Pricing Assessment Tool (CPAT).

[12] In addition, we assume complete pass-through of cost increases, unitary price elasticity of demand and no substitutability between factors. Incomplete pass-through, less elastic demand, and substitutability between labor and energy would result in lower job losses. Coke, refine petroleum and nuclear are not impacted jobwise as they have large import content. However, they could be possible candidates for border carbon adjustment taxes.

[13] This is consistent with evidence in the literature which find carbon pricing may not have significant impacts on competitiveness (Ellis and others 2019).

countries like India and Indonesia, and relatively low energy dependence of its industries. Increasing usage of coal above the baseline assumption of 23 percent share in energy production by 2035 could dilute this cost and competitive advantage, as carbon prices would need to be higher to reach the NDC targets.[14]

13. A carbon fee would be moderately progressive in Bangladesh. Based on the 2010 Household Income and Expenditure Survey (HIES), carbon fees would be disproportionately borne by the rich in Bangladesh as electricity and gasoline consumption accounts for only 0.4 percent of the monthly consumption for the bottom 5 percent of households as opposed to 2.4 percent for the top 5 percent (text figure).[15] Similarly, an average rural household would face less burden than an average urban household, primarily because majority of the rural households have limited commercial energy usage. The regressive indirect and adverse effects of a carbon fee on price of non-energy goods in the consumption bundle–driven largely by spending on food – are offset by the progressive direct impact of fuel consumption.[16] As more of the rural and low-income households gain access to electricity and other commercial energy sources, more targeted transfers would be required to compensate the most vulnerable households unless expansion of energy access to low-income households uses low-carbon technologies.[17]



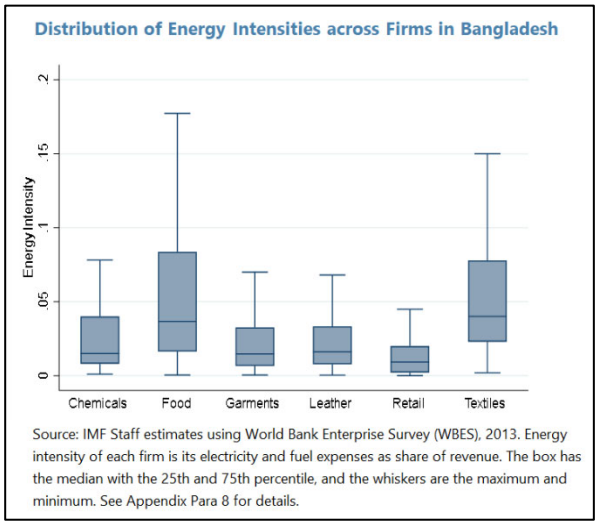
[14] Under the BAU baseline scenario, coal used in power generation is projected to increase from around 3 percent in 2018 to 24 percent in 2025 and slightly decrease to around 23 percent in 2035, compensated by the projected increase in renewables from around 1 percent in 2018 to 4 percent in 2035. Natural gas is projected to decline from 85 percent in 2018 to 65 percent in 2025 and 63 percent in 2035. At the 26th session of the COP26, Prime Minister Sheikh Hasina announced the cancellation of 10 coal-fired power plants involving US$12 billion foreign investment and setting a roadmap to have 40 percent of country's energy from renewal sources by 2014. Implementation of the nuclear power projects and renewable energy such as solar would reduce emissions under the BAU scenario, resulting in a lower carbon price to reach the NDC targets.

[15] While low-income households spend more on fuel and lighting as a share of their monthly expenditures, their primary energy source is biomass (firewood, cow dung, jute stick and fuel from agricultural products) that is in informal, non-commercial scale and does not fall under the carbon pricing regime.

[16] The impact is expected to be small because of the limited cost increase in non-energy goods and low carbon fuel usage by the poor. E.g., Using the 2010 HIES, fully compensating the lowest quartile of households for the burden of carbon tax would have been 880 million taka.

[17] The government is already committed to driving up renewable energy and has a host of incentives such as tax breaks on offer to drive net-metered solar rooftop installation (SHS). Government is working towards universal electricity access by 2021 by expanding the program.

14. A carbon fee could also foster efficiency gains.[18] Carbon pricing would not only incentivize the reallocation of resources from high-to low-carbon sectors, it could also help to safeguard and preserve less-energy intensive firms within each sector. Using the World Bank Enterprise Survey data from 2013, these allocative efficiency gains could be the largest for textiles and food manufacturing in Bangladesh as they have the highest dispersion in energy intensities. In addition, the less energy-intensive firms are also generally more productive in Bangladesh, reinforcing the limited risks on international competitiveness.[19] A proactive approach, starting with a small and gradual increase in carbon prices, would provide a clear signal of policy directions for firms, helping them to plan ahead in terms of investments to decarbonize their production processes and improve energy efficiency, thereby reducing stranded assets, risks to competitiveness, and job losses in the future.



Source: IMF Staff estimates using World Bank Enterprise Survey (WBES), 2013. Energy intensity of each firm is its electricity and fuel expenses as share of revenue. The box has the median with the 25th and 75th percentile, and the whiskers are the maximum and minimum. See Appendix Para 8 for details.

15. Carbon pricing could serve as an effective signaling tool and commitment mechanism for securing climate-financing and reaching its development goals.[20] An early adoption of carbon fee could make Bangladesh stand out among regional and worldwide peers and catalyze interest from donors and private investors interested in Economic, Social and Governance (ESG) lending commitments. A carbon user fee is incentive compatible, requiring a higher fee to reach the NDC target if the country chooses a less green pathway to meet its developmental needs. Introducing carbon pricing in line with the objectives of the Paris Agreement can serve as a concrete signal to ensure investment flows into Paris-compatible projects. "The simplicity of a price signal is preferable to an approach that requires a complex case-by-case evaluation of the climate impacts of every individual project" (OECD 2021). This is increasingly relevant now, given mounting pressure on providers of development financing and capital market investors to align their activities with the objectives of the Paris agreement and net-zero. As a useful commitment mechanism, carbon pricing could also catalyze private sector green investments from donors and capital market investors. Finally, for Bangladesh, early introduction of a carbon price could also help to prepare the grounds for concessions on border carbon adjustments (BCAs) and better tariff deals with trading partners like the EU among others, in the run up to LDC graduation.

[18] Under the Energy Efficiency and Conservation Master Plan up to 2030, the government aims to lower energy intensity (national primary energy consumption per unit of GDP) in 2030 by 20 percent compared to the 2013 level, resulting in a total savings of 95 million toe (113 billion m^3 of gas equivalent).

[19] Many studies find a small positive impact of carbon pricing on productivity and innovation (Ellis and others 2019).

[20] See OECD (2021) for a detailed review on the compatibility of carbon pricing with sustainable development.

C. Conclusion

16. Bangladesh is highly vulnerable to climate change and is concurrently facing other economic challenges and early adoption of a small carbon fee as a climate commitment mechanism towards its NDC targets can help to generate interest and/or catalyze funds and/or technical assistance for adaptation and assist with a just transition. Given that Bangladesh is a relatively low intensity brown energy user in the region, introduction of an early carbon fee on the energy sector could be an equitable and viable option for Bangladesh to reach its NDC targets with considerable co-benefits. The impact on inflation and loss of competitiveness and jobs will be limited. Moreover, the net revenue gains from a carbon fee can be earmarked to go towards funding a just transition by compensating the most vulnerable while preserving competitiveness and limiting job losses and distributional impacts on workers and households. Carbon pricing alone will not be sufficient to finance the adaptation needs of Bangladesh. However, the carbon pricing strategy through the implementation of an energy related user fee can serve as a commitment device for meeting Bangladesh's NDC targets and help to signal to donors and investors Bangladesh's strong climate mitigation commitments to further catalyze funds. This strategy can also be considered as a complementary incentive to negotiate better trade deals and prospective border carbon adjustment concessions in lieu of green commitments.

17. Donor support and financial flows in the pursuit of net-zero investments as well as negotiating climate friendly trade deals are critical for meeting Bangladesh's climate and developmental aspirations. With the decarbonization incentives in place, external finance will be less costly as the climate part of the environmental impact assessment of an investment will be in place. Also, Paris-incompatible projects, such as coalfired power plants, will become less appealing as they will mandate higher rates of carbon fees in line with the NDC carbon goals. That said, a departure from the commitment to green energy supporting growth would imply higher carbon fees to reach the NDC emission targets. In addition, with an early commitment to carbon pricing, bilateral trading partners like the EU and others can facilitate better terms for prospective border carbon taxes abroad and/or negotiate favorable trade deals in the run up to LDC graduation.

18. Carbon pricing is not the be-all-end-all solution for catalyzing external finance. Complementary fiscal policies such as ETS, feebates, feed-in tariffs, accelerated depreciation, R&D and investment tax credits etc. can help accelerate the decarbonization process. Besides the fiscal measures, enhancing the investment climate, strengthening climate-related regulations, promoting diffusion of information and technologies, preservation of natural capital, appropriate labor force skilling and reforms to deepen the financial sector would help to foster an enabling environment for finance and investment needed for Bangladesh to achieve its climate goals in a just manner.

19. The authorities highlighted their commitment to meeting the climate challenge. They underscored that Bangladesh has been on the forefront of climate action, including operationalizing the Climate Fiscal Framework and establishing Climate Change Trust Fund. They highlighted their continued efforts, including via several central bank initiatives, to promote solar and other renewal energy sources to reduce emissions. BB also circulated the Sustainable Finance Policy for Banks and

Financial Institutions in December 2020 and incorporated lists of 68 Green Products/Projects/ Initiatives. They added that ten coal-fired power plants projects have been cancelled. The authorities emphasized that Bangladesh has largely been a recipient of climate change and concessional climate financing is needed to meet their mitigation and adaptation challenges. The authorities are also strengthening the regulations for tapping ESG finance, including BB's issuance of Environmental and Social Risk Management Guidelines for mainstreaming ESG in overall credit rating methodology. While they broadly agree that a carbon charge or user fee could signal their commitment towards meeting their NDC targets, they reiterated that carbon pricing should be also adopted by other economies. The authorities expressed interest in exploring the potential of an Emissions Trading System (ETS) for Bangladesh in light of the political feasibility concerns with regards to carbon taxation. They noted the political economy constraints linked to plausible increase in production costs and energy prices, and that implementing a progressive carbon charge was impeded by several factors, such as the lack of competent energy auditors.

20. Donors commended the idea of a carbon charge or user fee as a good first step for meeting Bangladesh's NDC targets but more was needed to translate it into a catalyst for climate financing. While some donors said it could be a good first step towards bringing on a financing response, others noted that more effort is needed in creating and identifying climate friendly and viable investment projects. Continued efforts towards reforming the financial sector and improving corporate governance should remain the key priorities to attract investments.

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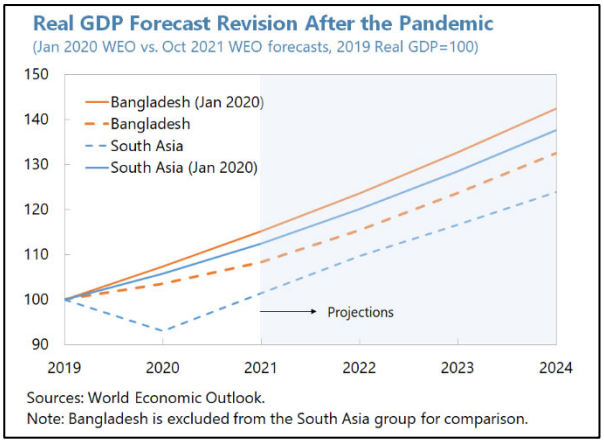
THE MEDIUM-TERM EFFECT OF COVID-19 IN BANGLADESH[1]

The Global community has been battling the COVID-19 pandemic for two years, and Bangladesh is no exception. Literature shows that severe crises like the COVID-19 are likely to leave medium-term effect on potential output. Bangladesh aims to become a developed country and eliminate poverty by 2041, which is a challenging task even without the pandemic.[2] Exploring the effect of the pandemic on key factors of production is important to mitigate the medium-term impact of the crisis and to develop policy priorities to boost potential to achieve their development aspirations.

A. Context

1. Bangladesh has been hit hard by the pandemic. Before COVID-19, growth has been impressive in Bangladesh, thanks to the successful transformation to a more manufacturing and service-based economy and robust external demand. However, the global outbreak of the pandemic hit Bangladesh hard through multiple supply and demand shocks. On the supply side, nationwide lockdowns caused factories to cut production, while the drop of external demand and disruption of global supply chain exacerbated production losses. On the demand side, increased unemployment, and loss of income dampened household consumption. With idle capacity amid significant uncertainty around the evolution of the pandemic, businesses have remained hesitant in investing, as seen in continued subdued private credit growth. As a result, Bangladesh economic growth in FY20 fell to a historical low, though it has fared better than regional peers benefiting from external demand recovery, stimulus to export-oriented sectors, and a surge in remittance.



2. Severe crisis like the COVID-19 is more likely to leave a medium-term effect. Once the virus is under control, containment measures will be lifted, and idle production capacity can be utilized again. But this does not necessarily mean the economy will automatically rebound to its pre-crisis track. Plenty of evidence since the 1980s suggest that deep recessions are likely to cause medium-term effect, i.e., cyclical fluctuations affecting the steady growth path.[3] This is because the shocks from temporary recessions have forced changes on the development paths of key factors of

[1] Prepared by Fan Qi (APD).

[2] See 2021 *Bangladesh: Selected Issues Paper* "Bangladesh in Transition" for a comprehensive analysis on the challenges Bangladesh is likely to face during its transition to higher income status.

[3] See a comprehensive literature review by Cerra and Saxena (2020) on this effect; see also discussions about after-effects of the pandemic in IMF (2021) and World Bank (2020a and 2021a).

growth such as capital, labor, and productivity, which will in turn affect long-run growth. On the other hand, the medium-term effect of crises also suggests that policy measures targeted at smoothing cyclical fluctuations could play a role in upholding trend growth – if implemented in a timely and appropriate manner to prevent prolonged impairment of the factors of growth.

B. Methodology

3. Various methods have been used to measure the medium-term effect of the pandemic. For country groups, cross-country data on past deep recessions and health crises have been used to measure the impact on capital, employment, and total factor productivity (TFP) using panel regressions, which is then used as a reference point on what might be expected for the impact of the COVID-19 (IMF 2021; World Bank 2020a and 2021a). For individual countries, as data of real recessions or health crises is insufficient, the most straightforward way is to compare the projections of potential output before and after the pandemic, with the difference being the effect of the COVID-19. Methods differentiate depending on how to measure potential output. Among others, growth accounting has been used by many given its clear advantages of combining economic structure and the strength of filters.[4] This note uses the growth accounting framework to measure the medium-term effect of COVID-19 in Bangladesh.

4. The growth accounting framework. A simple Cobb-Douglas production function is used to analyze the growth path of the economy before and post-pandemic, where Y_t is output, A_t is TFP, K_t is total capital stock, h_t is human capital index, L_t is total employment, and β is capital's share of income.

$$Y_t = A_t K_t^{\beta} (h_t L_t)^{(1-\beta)}$$

Data on Y, K, h, L, and β are taken from the authorities, the Penn World Table 10.0, United Nations, and International Labour Organization (ILO). Based on ILO modeled estimates, 1-β, or labor's share in income for Bangladesh has gradually declined during 2004-17 and this exercise will take an average value of 0.44.[5] TFP is calculated as a residual. See more details on data in Annex Table I.

5. Scenario analysis is used to estimate the medium-term effect of COVID-19 for FY21-25. In each scenario, assumptions on the growth of actual Y, K, h, and L are made, and TFP is calculated as a residual. Then, the Hedrick-Prescott (hp) filtered h, L, A and the projected actual K will be used to calculate the potential output in each scenario.[6] The differences in potential output

[4] Such as analyses by Fernald and Li (2021) for the United States, Bannister et al. (2020) for Australia and New Zealand, IMF (2013a and b) for Portugal and Brazil, IMF (2014) for South Africa and Anand et al. (2014) for Emerging Asia, and IMF (2018) for Bangladesh.

[5] The ILO modeled estimates have already been adjusted for self-employment. One possible explanation to declining share of labor income could be the force of global integration, which contributed to raising the capital intensity in production. See April 2017 WEO, Chapter 3.

[6] Using actual K instead of filtered K is common in literature, see Sun (2010) and Estevão et al (2010).

between the two pandemic scenarios and the no-pandemic scenario is considered the pandemic's medium-term effect.

6. Major assumptions about the scenarios are: (see more details in Annex Table 2).

- **No-pandemic scenario.** The growth rate of real GDP and capital stock is consistent with January 2020 World Economic Outlook (WEO). Labor force participation is assumed to gradually increase over time, while unemployment rate is to gradually decline, following the developments before the pandemic (see text figure). Human capital, proxied by an index of average years of schooling, is assumed to keep the pre-crisis annual growth rate of 1.29 percent.[7]

- **Pandemic-baseline scenario.** The growth rate of real GDP and capital stock is consistent with October 2021 WEO. The capital depreciation ratio is assumed to be lower than pre-crisis level during FY20-22 to reflect the closure of factories during lockdowns. Labor force participation and employment will deteriorate in FY20, then gradually get back to pre-crisis level in FY23, when vaccines are expected to be widely available in Bangladesh and GDP growth picks up.[8] From there, labor market situation is assumed to continue improving. Human capital growth is expected to slow down only as students affected by school closures during the pandemic enter labor market.[9] For example, people aged 24 in FY20 will enter the job market in FY21, while primary students today will start to enter the job market in FY33. Remote learning is considered to have mitigated 30 percent of the loss on years of schooling, as a highly simplified assumption.[10] As a result of the staggering entrance into the labor market, school closure will show its full impact on growth during the long run.

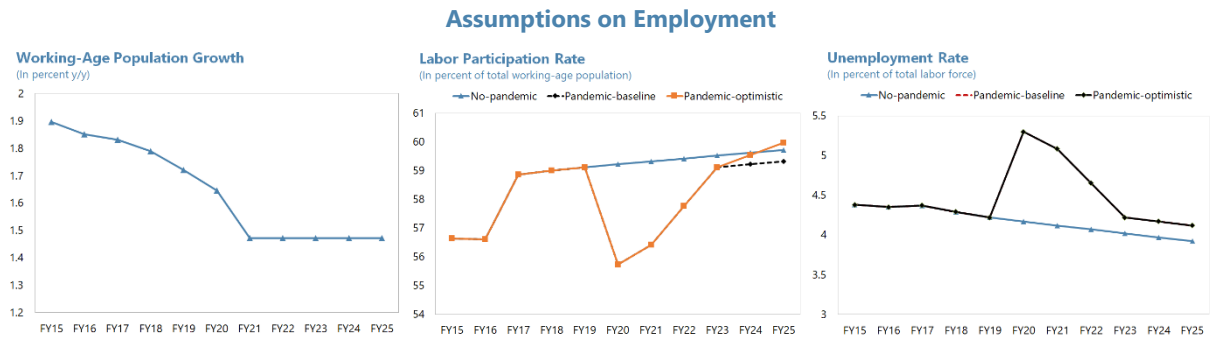
- **Pandemic-optimistic scenario.** The growth rate of real GDP and capital stock is consistent with the authorities' estimates and the 8th Five-Year Plan (FYP). Labor force participation path is the same with the pandemic-baseline scenario until FY23, before attaining the higher level assumed in the 8th FYP. Assumptions on depreciation ratio, unemployment rate, and human capital are the same as in the pandemic-baseline scenario.

[7] The index is calculated using a Mincer equation building on the average years of schooling for the age group 25+ published by Barro and Lee (2013) and the rates of return for education suggested in Caselli (2005).

[8] ILO (2021a) also projects in its baseline scenario that total working hours will fall short by 3.5 percent in 2021 and by 0.9 percent in 2022, relative to the no-pandemic scenario. This means that the working hour gap in Bangladesh could close in FY23 if the economy continues to recover.

[9] Consistent with the methodology of the Penn World Table, only people aged 25 and above are considered.

[10] World Bank (2020b) suggests using a 30 percent effectiveness rate for mitigation measures in Lower-Middle Income Countries in an optimistic scenario (assuming school closure for 3 months). For more analysis on Bangladesh's mitigation measures, please see Rahman and Sharma (2021).



Sources: UN, ILO, and IMF staff estimates.
Note: The unemployment rates are assumed to follow the same path since FY20 for both the pandemic-baseline and pandemic-optimistic scenarios.

7. It is worth acknowledging great uncertainties around these projections due to the nature of the pandemic. First, the growth accounting methodology has a highly simplified economic structure and some of its inputs are difficult to be precisely estimated or interpreted. The pandemic also prevented timely national survey on labor market. Second, some assumptions in the scenarios are subject to large uncertainty. Capital stock may not grow as quickly as expected if balance sheet burdens of the financial system cannot be properly addressed or more equity investment cannot be mobilized. Human capital loss could increase if remote learning is less effective or more students drop out of schools after the pandemic. Additionally, the unprecedented nature of the COVID-19 crisis and its uneven impact on individual countries means that past experiences or peer country data cannot be easily used as reference points. Therefore, the results of this exercise should be interpreted with caution, and more in-depth research should be conducted when data is available.

C. Results from Growth Accounting

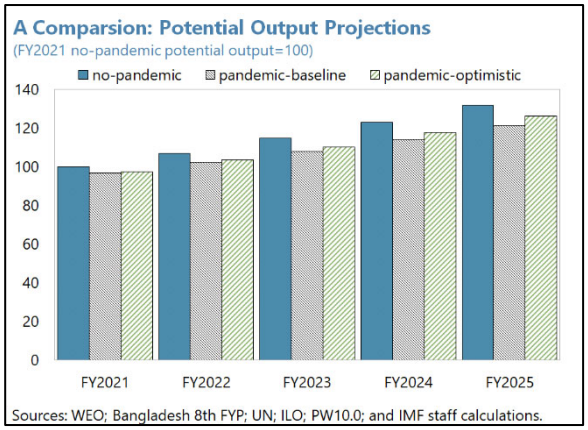
8. In the pre-pandemic period, capital accumulation is the key driver of increasing potential growth, while TFP growth also contributed. The growth rate of capital stock has reached an average of 8.7 percent during FY15-19. Combined with a relatively high capital share of income, the increase in the speed of capital accumulation explained most of the rise in potential GDP growth. This is also consistent with the fact that Bangladesh has a higher capital formation-to-GDP ratio compared to its peers. The contribution of trend TFP growth, though negligent during FY00-04, has gradually picked up afterwards. The contributions of trend labor and human capital are relatively stable, with the growth of labor quality to some extent offsetting the decline of labor quantity growth in recent years.

Table 1. Bangladesh: Growth Accounting (2000–2019)

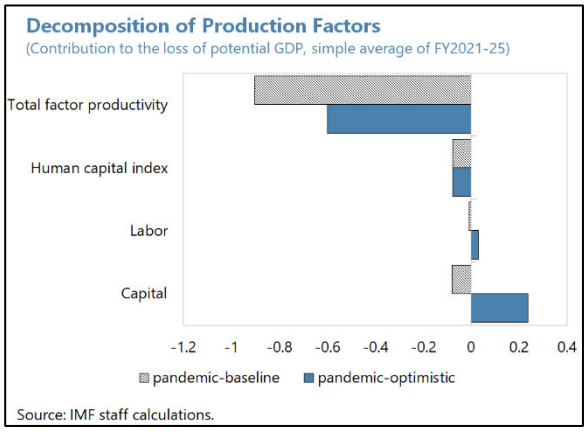
	Contributions to growth (percentage points)				
	Potential GDP growth	Capital	Labor (trend)	Human capital (trend)	TFP (trend)
FY00-04	5.5	3.8	1.0	0.5	0.0
FY05-09	6.0	4.5	0.9	0.6	0.1
FY10-14	6.3	4.7	0.8	0.6	0.2
FY15-19	6.8	4.9	0.8	0.6	0.6

Source: IMF staff calculations.

9. In both pandemic scenarios, the COVID-19 crisis will leave medium-term effect on potential growth. In the pandemic-baseline scenario, average potential growth rate during FY21-25 is around 1.1 percentage points lower compared to the no-pandemic scenario. In the pandemic-optimistic scenario, if the assumptions on real GDP, investment, and employment growth taken from the 8th FYP can be fully realized by FY25, this negative growth effect could be largely mitigated, leaving the average potential growth rate during FY21-25 to be only 0.4 percentage point lower than without the pandemic.



10. Decomposition shows that productivity has the most significant effect on potential growth loss. In both pandemic scenarios, most of the decline in average potential output growth rate is due to lower trend TFP growth rate. In the pandemic-baseline scenario, capital and labor also dragged down potential output growth rate to some extent, while in the pandemic-optimistic scenario, fast rebound of capital and labor played a compensating role. Only a fraction of potential output loss is caused by losses in human capital. However, it is likely because most of the impact of human capital is spanned in the longer run, when students (aged 5-19) affected by the pandemic today enter the labor market during FY26-40.



11. Sensitivity checks are conducted with different assumptions on TFP growth. TFP has been calculated as a residual in the three scenarios. Now we consider deriving TFP growth using the long-run relationship between capital accumulation and balanced growth, following the methodology proposed by Bannister et al (2020).[11] In the pandemic-baseline scenario, this will lower potential growth loss to 0.77 percentage point, in which the contribution from TFP growth loss is 0.6 percentage point. In the pandemic-optimistic scenario, the potential growth loss is halved to 0.2 percentage point, in which TFP growth loss is 0.4 percentage point. Assuming unchanged capital depreciation ratio in the two pandemic scenarios will only have minor impact on output and TFP growth loss. In addition, if the effectiveness of remote learning is reduced to 7 percent, human capital's contribution to potential growth loss will rise to 9.5 percent from the current 7.1 percent in the pandemic-baseline scenario, though still well below that of the TFP.[12] These sensitivity analyses

[11] The decomposition of growth is: $\Delta \ln Y_t^* = \Delta \ln A_t^* + \beta \Delta \ln K_t + (1-\beta)\Delta \ln h_t^* + (1-\beta)\Delta \ln L_t^*$, where * means trend. Assuming $\Delta \ln K_t^* = \Delta \ln Y_t^*$, we could get: $\Delta \ln A_t^* = (\Delta \ln K_t^* - \Delta \ln h_t^* - \Delta \ln L_t^*)*(1-\beta)$.

[12] World Bank (2020b) suggests using a 7 percent effectiveness rate for mitigation measures in Lower-Middle Income Countries in a pessimistic scenario (assuming school closure for 7 months).

confirm that (i) the pandemic is likely to have medium-term effect, and (ii) slowdown in TFP growth is a major factor in the decline of medium-term potential growth.

12. Multiple reasons could cause the drop of TFP growth in the pandemic scenarios. On the one hand, TFP to some extent represents technology progress. Slower technology growth after a severe pandemic could be explained by less investment in technology due to weakened balance sheets of firms and financial institutions, and loss of management skills and knowhow as viable firms fall bankruptcy. On the other hand, TFP is a residual that includes all factors affecting potential output other than capital, labor, and years of schooling. The divergence between high capital growth and subdued TFP growth might suggest inefficient use of capital. Average hours worked per employee, which became extremely important during the pandemic, is not considered in labor input but will have an impact on skill accumulation of workers.[13] The allocation of resources could become less efficient due to credit rationing (banks favoring large enterprises during a crisis) and displaced workers (people having to move to different jobs, especially unskilled labor).[14]

D. Heading for a Resilient and Inclusive Recovery

13. To revive growth potential, targeted policy measures are needed to mitigate the immediate impact of the pandemic, while not losing sight of the longer-term goals.[15]

- **Private investment should be revived to support recovery of growth.** Bangladesh's investment as a share of GDP has been high among peers, and capital stock has historically contributed to about 2/3 of potential output growth. In the pandemic-optimistic scenario, the fast rebound of investment towards the target investment-to-GDP ratio of 36.6 percent by FY25 is a major factor mitigating the loss in potential GDP growth. To realize this goal, focus should be placed on reviving investment, especially private investment. This will require improving the balance sheets of financial institutions, removing distortions in key interest rates to facilitate market-based lending, and creating a benign investment climate to attract foreign financing. Capital market development to provide long-term financing will also be critical. Public investment should focus on providing key infrastructures efficiently to remove bottlenecks for private sector development.

- **Boosting productivity has become a more important and urging task.** The LDC graduation in 2026 calls for higher productivity, as Bangladesh will face more intense competition in its export markets. The pandemic also poses new challenges. The authorities have announced

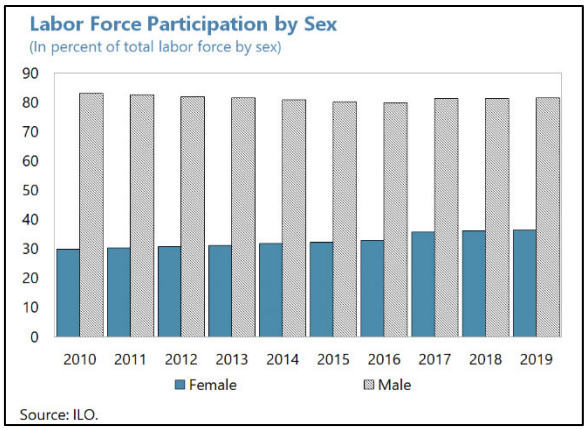
[13] ILO (2021b) shows that the drop in working hours has been driven, to an almost equal extent, by a reduction in employment and by a reduction of the hours worked among those who remained employed.

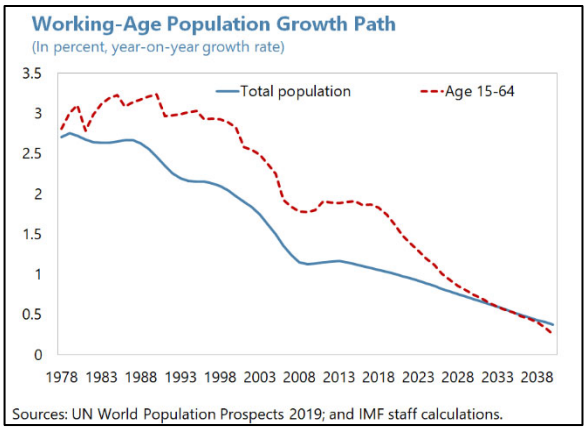
[14] Local thinktank survey shows that during June 2020 to March 2021, 41 percent of interviewed workers have to move to another occupation. For example, in the skilled labor group, 60 percent of people maintained a skilled-labor job, 15 percent became unemployed, while 25 percent ended with unskilled labor. The survey was conducted by Power and Participation Research Centre and BRAC Institute of Governance & Development on 6,099 households.

[15] While the authorities' efforts to address the economic fallout of the pandemic - including through implementation of the stimulus packages of Tk. 1.9 trillion and monetary expansion - have helped, reviving potential growth would require decisive reforms to address structural issues.

several skills development programs and planned to kick off the implementation of the Productivity Masterplan in FY22. Timely implementation and regular review of progress will be key to success. More needs to be done on technology achievements by exposing the economy to foreign technologies through foreign trade and foreign direct investment (FDI), increasing the penetration rate of traditional (energy, transportation) and modern (internet, mobile phone) technologies. On the positive side, opportunities grow out of crisis as digital platforms and payment methods flourished in Bangladesh during the pandemic. In this regard, "Digital Bangladesh", with appropriate risk monitoring and supervision, could help increase penetration of technology and make growth more inclusive and efficient.

- **Making the recovery human-centered.** Unemployment of female and young workers have historically been high, and the pandemic could only make it worse.[16] To achieve the 8th FYP's projection on employment growth, increased efforts are needed to boost labor participation rate post-pandemic, especially for women (text figure) and young people.[17] Labor force survey would help diagnose legacies of the COVID-19 and facilitate policy support to the most needed. Investment should be made in the health and skills of workers, while diversifying the economy could help create more decent jobs. Based on UN estimates, working-age population growth will fall below total population growth by around 2036 (text figure). It is vital to realize the full potential of the young labor force within the next decade.

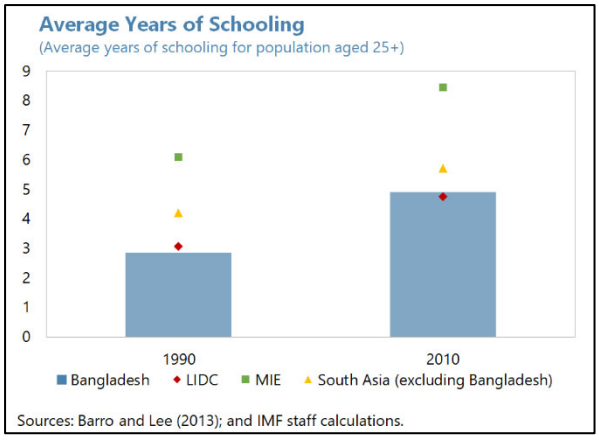




[16] Based on the latest Bangladesh labor force survey, female and male unemployment rate (age 15-24) in 2017 is 16.8 percent and 10.8 percent, respectively, while total unemployment rate (age 15+) is 4.4 percent. See: https://www.ilo.org/shinyapps/bulkexplorer38/?lang=en&segment=indicator&id=EAP_2EAP_SEX_AGE_NB_A

[17] Female labor force participation rate has been stagnant for years before the pandemic and much lower than male labor force participation rate. The target in the 8th FYP is to increase female labor force participation rate from around 36 percent to 43 percent.

- **Human capital has a bigger role to play in the future.** Bangladesh has made significant achievements in increasing human capital during FY1990-2010, but there is still an education gap with peers (text figure). World Bank (2021b) shows that technical and managerial expertise levels are low in most Bangladeshi firms.[18] Better education is the key to help the country better absorb technology and move up the value-added chain. The prolonged school closure during the pandemic will have a negative impact on the growth rate of human capital in the long run, likely with a compounding effect, so actions are needed today to limit this impact.[19] The authorities should strive to increase the share of students returning to school, adapt curriculum and teaching methods to help students catch up with peers based on student ability assessments, and continue to increase government education investment as stated in the 8th FYP.[20]



Sources: Barro and Lee (2013); and IMF staff calculations.

E. Conclusion

14. Bangladesh has been hit hard by the COVID-19 pandemic, which is likely to leave medium-term effect on the potential output. A growth accounting framework and scenario analysis are used to measure this effect. The results show that in both pandemic scenarios, the COVID-19 crisis will leave medium-term effect on potential growth. However, if the assumptions on real GDP, investment, and employment growth taken from the 8th FYP can be fully realized by FY25, the negative growth effect could be largely mitigated. To revive growth potential, targeted policy measures are needed to mitigate the immediate impact of the pandemic, while not losing sight of the longer-term goals. Focus should be placed on reviving private investment, boosting productivity, and investing in education and health of the labor force.

[18] For example, more than 75 percent of firms do not have any workers with a college degree in engineering or applied science. The mean percentage of the workforce with an MBA or master's level degree is only 2.4 percent.

[19] The compounding effect means that loss of earning at lower grades will reduce learning in all subsequent grades. This effect is found by many researchers, such as Andrabi et al. (2020) and Kaffenberger (2020).

[20] The goal is to increase public education spending from 2 percent of GDP in FY2019 to 3 percent of GDP in FY25.

Annex I. Data

Table A1. Bangladesh: Data Description and Sources

Indicator	Sources	Comments
Capital stock	Penn World Table 10.0	Capital stock= Actual real GDP*Capital stock-to-GDP ratio
	Bangladesh Bureau of Statistics	Latest data as of FY20.
Real GDP	Bangladesh Bureau of Statistics	Latest data as of FY20.
Depreciation rate	Penn World Table 10.0	Latest data as of FY19.
Labor's share of income	International Labour Organization	Average level during FY11-17.
Human capital	Penn World Table 10.0	Average years of schooling for population aged over 25 years. Latest data as of FY19.
Working-age population	United Nations World Population Prospect 2019	Both historical estimates and medium-variant projections are used.
Labor participation rate	International Labour Organization	Latest data as of FY20.
Unemployment rate	International Labour Organization	Latest data as of FY20.

Table A2. Bangladesh: Assumptions in the Medium-Term (FY21–25)

Indicator	No pandemic scenario	Pandemic-baseline scenario	Pandemic-optimistic scenario
Real GDP (Y)	Jan 2020 WEO projections	Oct 2021 WEO projections	Authorities' estimates for FY21-22, 8th FYP real GDP growth projections for FY23-25
Capital stock (K) Kt=I+(1-δ)*Kt-1	I: Jan 2020 WEO projections δ: 4% (equal to 2019 level)	I: Oct 2021 WEO projections δ: 2%, 3.2%, 4% for FY20-22 (50%, 60%, 80% of 2019 level), 4% for FY23-25	I: Authorities' estimates for FY21, 8th FYP projections for FY22-25 δ: the same with the pandemic-baseline scenario.
Human capital index (h)	1.29% (equal to 2011-19 growth rate)	1.25%, 1.18%, 1.13%, 1.13%, 1.13% for FY21-25, respectively.	The same with the pandemic-baseline scenario.
Labor force participation rate (LFPR)	FY19 LFPR=59.1%. LFPR has increased by an average of 0.1 pp each year during FY17-19. The assumption is LFPR will increase by 0.1 pp each year during FY20-25.	Based on ILO estimated LFPR of 55.7% in FY20, it is assumed that LFPR will gradually pick up during FY21-22. It will get back to 59.1% in FY23 and increase by 0.1 pp each year in FY24-25.	Based on ILO estimated LFPR of 55.7% in FY20, it is assumed that LFP will gradually pick up during FY21-22. It will get back to 59.1% in FY23 and increase according to the labor force growth rate assumed in the 8th FYP.
Unemployment rate (UNR)	FY19 UNR=4.22%. UNR has decreased by an average of 0.05 pp each year during FY17-19. The assumption is UNR will decline by 0.05 pp each year during FY20-25.	Based on ILO estimated UNR of 5.3% in 2020, it is assumed that UNR will gradually decline during FY21-22 but still higher than FY19. It will get back to 4.22% and stay at this level since FY23.	The same with the pandemic-baseline scenario.
TFP	Residual	Residual	Residual

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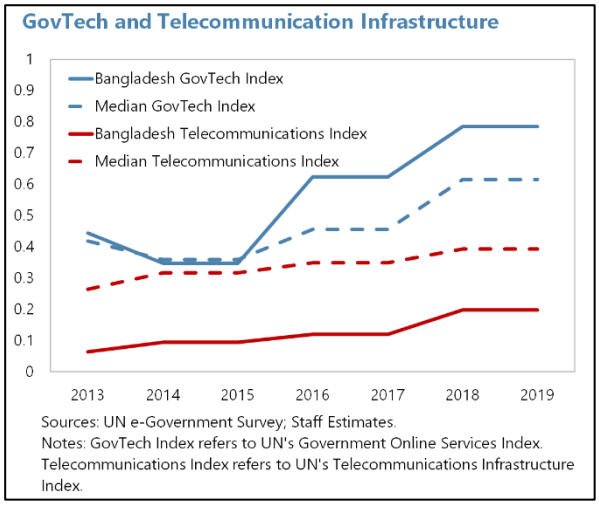
DIGITALIZATION AND PUBLIC FINANCE EFFICIENCY[1]

Digital technologies offer powerful tools that public administrations can leverage on to modernize and improve their operational efficiency. Bangladesh has progressively embraced GovTech solutions over the past decade and has adopted an ambitious digitalization agenda in the 8th Five-Year Plan (FYP). This note discusses Bangladesh's digitalization advancements and presents empirical evidence in support of GovTech efforts to improve tax revenue performance, as well as health and education outcomes.

A. Introduction

1. Bangladesh has made significant progress in digitizing its public services since the launch of 'Digital Bangladesh' in 2009. The 'Digital Bangladesh' strategy includes digital government as one of its four pillars and aims at transforming the country to a knowledge-based economy by 2041. The national portal created in 2014 hosts over 45,000 websites and services of government agencies, while more than 5,000 digital centers operate across the country offering digital services to those living in remote areas. Government employees' salaries and pensions payments can now be disbursed via Electronic Funds Transfer (EFT), while more than 20 million citizens have received different allowances from a digital government-to-person (G2P) payment system. The authorities aim to bring under the digitized payment system all cash transfer programs by June 2022. An online platform (e-challan) has been developed and implemented to support electronic processing of government receipts. More recently, an electronic income tax deduction at source (e-TDS) system was introduced by the National Board of Revenue, while the process of installing Electronic Fiscal Devices to facilitate VAT collection is ongoing.

2. Can Bangladesh increase government efficiency by stepping up its digitalization efforts? Bangladesh is gradually digitalizing its government operations to reduce its digital divide to other public administrations (Section B). The important policy question that arises is whether *e-governments* are better at mobilizing revenue or spending their resources more efficiently. This question is explored empirically in this annex using a broad sample of 180 countries at different stages of GovTech development during the period 2013-2019. The overall progress in e-government is proxied by the United Nation's Online Service Index that assesses the scope and quality of public sector online services, including online services for tax submission and registration of businesses. Digitalization can enable



[1] Prepared by Emmanouil Kitsios (APD). The section on education and health spending efficiency is based on joint work with Sanghamitra Mukherjee (IMF summer intern).

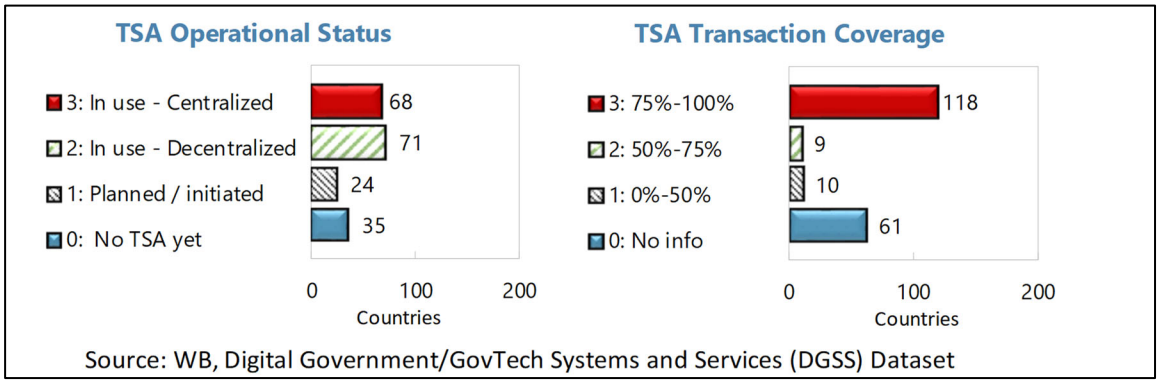
governments to improve the efficiency of expenditure and tax policies by facilitating the collection and processing of more reliable, timely, and accurate information on relevant stakeholders. Moreover, the digitalization of public finance can help enhance access to services and entitlements, reduce errors and frauds, strengthen procurement procedures, and improve tax compliance by simplifying the tax-filing process. We focus on three public administration performance areas that digitalization has significant potential to improve: (i) government revenue productivity (Section C) (ii) health outcomes (Section D); and (iii) educational outcomes (Section E).

B. State of GovTech in Bangladesh

3. Despite the impressive progress made, there is ample scope to scale up the use of digital technologies in cash management, revenue administration, payroll systems, and procurement.

- **Treasury Single Account (TSA):** Bangladesh has an operational, yet decentralized TSA system that is covering only between 25 to 50 percent of the government's revenue and expenditure transactions. All other regional peers record at least 75 percent of transactions, while most of them benefit from centralized TSAs.[2]

Treasury Single Account (TSA)			
Country	Year	Status	Services
Bangladesh	2008	2	1
Bhutan	2008	2	3
India	1963	3	3
Maldives	2009	3	3
Nepal	2013	3	3
Sri Lanka	2007	2	3

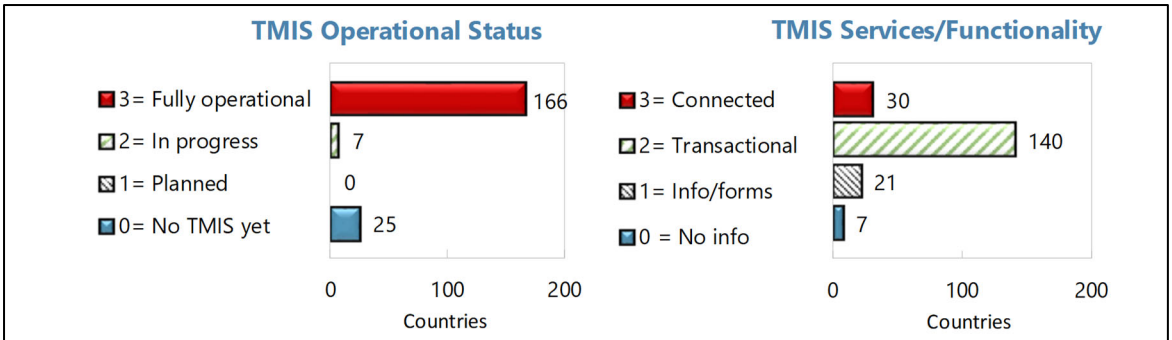


Source: WB, Digital Government/GovTech Systems and Services (DGSS) Dataset

- **Tax Management Information System (TMIS):** Implementation of a fully operational and connected TMIS is in progress, while most other countries in the region—and worldwide—have operationalized such systems. Sri Lanka and other 29 countries have connected services or are operating a single window platform.

Tax Administration (TMIS)			
Country	Year	Status	Services
Bangladesh	2018	2	2
Bhutan	2015	3	2
India	1981	3	2
Maldives	-	2	2
Nepal	2010	3	2
Sri Lanka	2014	3	3

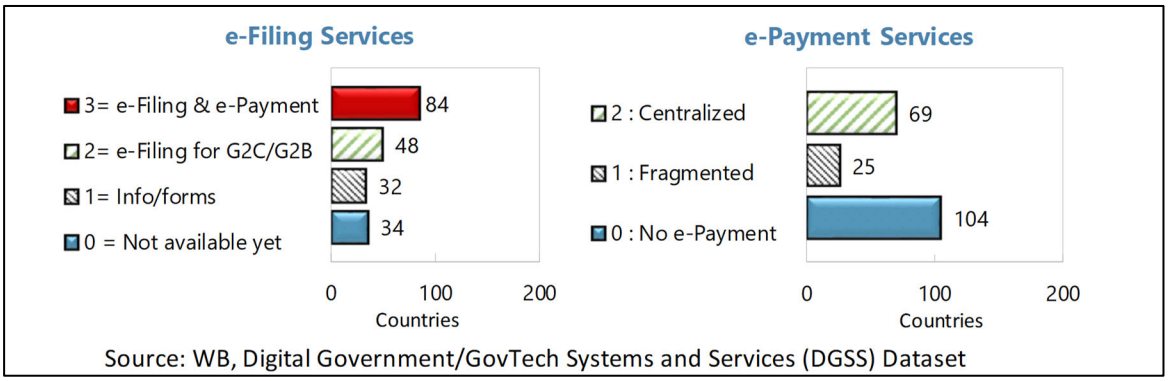
[2] Higher indices for status and services indicate more digitally advanced public financial management systems.



Source: WB, Digital Government/GovTech Systems and Services (DGSS) Dataset

- **e-Filing and e-Payment:** Bangladesh provides tax related information and forms online but does not have yet centralized e-filing and e-payment services for citizens (G2C) and businesses (G2B). Most other countries in the region include G2B and G2C functionalities in their e-tax systems, with India's system offering both e-filing and e-payment options, while Sri Lanka implements a centralized e-payment platform.

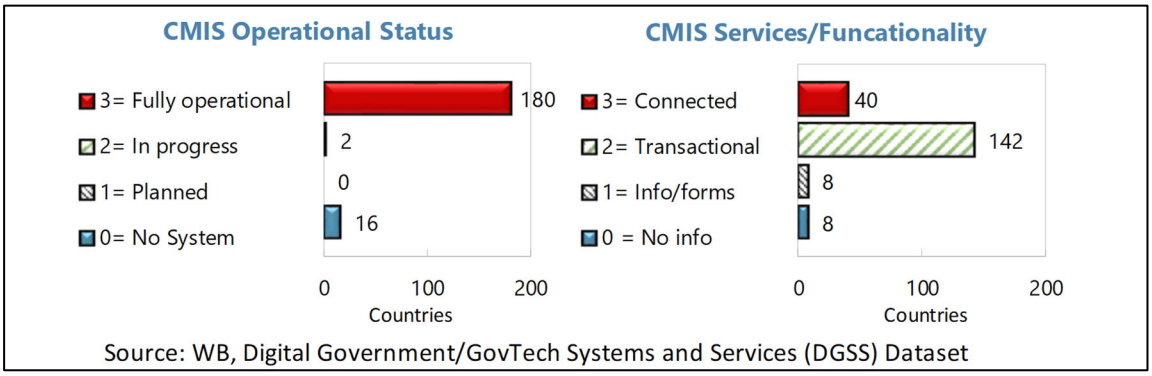
	e-Filing		e-Payment	
Country	Year	Services	Year	Services
Bangladesh	-	1	2012	1
Bhutan	2009	2	-	0
India	2005	3	2011	1
Maldives	2013	2	-	0
Nepal	2013	2	-	0
Sri Lanka	-	1	2012	2



Source: WB, Digital Government/GovTech Systems and Services (DGSS) Dataset

- **Customs Administration Management Information System (CMIS):** Bangladesh has a fully operational online customs system (ASYCUDA World system) interfacing with the computer system of the Bangladesh Bank, the Sonali Bank, the Navy and the Chattogram Port Authority. The system offers transactional capabilities but is not operating yet as a single window. Once fully operational, the Bangladesh Single Window (BSW) system will allow traders to submit all import, export and transit information required by customs and other agencies via a single electronic gateway instead of paper-based processing systems. All countries in the region operate CMIS with similar functionalities, while 40 countries in the world operate more advanced systems.

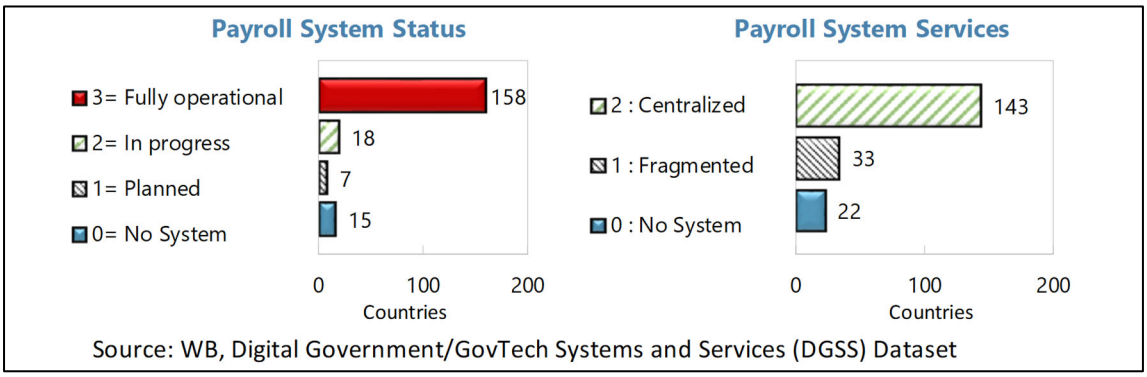
Customs Administration (CMIS)			
Country	Year	Status	Services
Bangladesh	1994	3	2
Bhutan	2015	3	2
India	1997	3	2
Maldives	1994	3	2
Nepal	1998	3	2
Sri Lanka	1994	3	2



Source: WB, Digital Government/GovTech Systems and Services (DGSS) Dataset

- **Payroll System:** All South Asian countries have fully operational payroll systems. Bangladesh and India have not fully centralized their payroll platform. In the case of Bangladesh, the authorities argue that the iBAS++ system currently covers about 96 percent of the payment of salaries and allowances and its coverage will be complete with the forthcoming inclusion of a few self-accounting entities. On the other hand, Bhutan, Maldives, Nepal and Sri Lanka are implementing a centralized payroll platform that is shared across line ministries. Most countries worldwide operate fully centralized payroll systems.

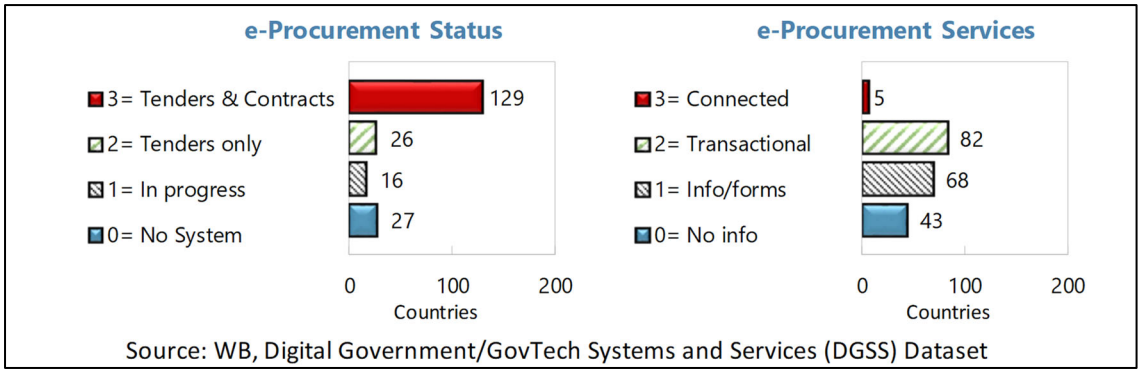
Payroll System			
Country	Year	Status	Services
Bangladesh	2016	3	1
Bhutan	2014	3	2
India	-	3	1
Maldives	2010	3	2
Nepal	2004	3	2
Sri Lanka	2012	3	2



Source: WB, Digital Government/GovTech Systems and Services (DGSS) Dataset

- **e-Procurement System:** The 7th FYP envisioned the expansion of Bangladesh's electronic procurement system (e-GP) to encompass all the public institutions. Currently, 55 percent of all procurement is conducted under the e-GP system according to the 8th FYP. The portal publishes tender and contract information and includes bidding documents and contract awards. The e-GP portal offers more functionality compared to those of Bhutan and the Maldives that only publish tenders.

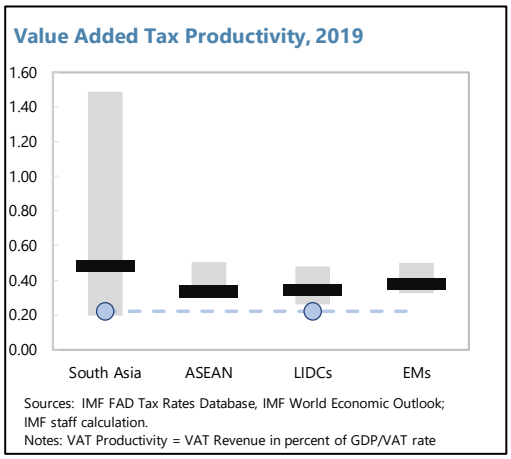
e-Procurement			
Country	Year	Status	Services
Bangladesh	2011	3	2
Bhutan	2017	2	3
India	2007	3	2
Maldives	2011	2	1
Nepal	2014	3	2
Sri Lanka	-	1	0



Source: WB, Digital Government/GovTech Systems and Services (DGSS) Dataset

C. Digitalization and Revenue Collection Efficiency

4. Can digitalization help Bangladesh improve its revenue efficiency that is low by regional and international standards? To explore this question, we estimate the effect of the government digitalization proxy ($GovTech$) on annual efficiency measures of Value Added Tax (VAT), personal income tax (PIT) and corporate income tax (CIT).[3] These tax efficiency measures are the dependent variables of interest ($Tax_{i,t}$).[4] Country fixed-effects (α_i) are used to capture any time-invariant country-level heterogeneity (equation 1). The vector $\mathbf{X_{i,t-1}}$ includes lagged values of covariates that are also likely to affect revenue productivity, such as (a) GDP per capita to proxy for the level of development; (b) government spending as a share of GDP to proxy for the government size; (c) agriculture's share of GDP as a proxy for informality; (d) trade openness that is defined as the sum of the country's imports and exports shares of GDP; (e) the UN's telecommunication index to control for the broader digital technological infrastructure available in the country; (f) UN's human capital index to proxy for digital literacy; and (g) and an indicator on the control of corruption retrieved from the World Governance Indicators (WGI) database.[5]



Sources: IMF FAD Tax Rates Database, IMF World Economic Outlook; IMF staff calculation.
Notes: VAT Productivity = VAT Revenue in percent of GDP/VAT rate

[3] See Kitsios, Verdier and Jalles (2020) for a study examining the effect of government digitalization on reducing cross-border fraud and increasing trade related revenue.

[4] VAT productivity is measured as the ratio of VAT revenue to the product of GDP and the standard VAT rate. VAT C-efficiency is measured as the ratio of actual VAT revenues to the product of the standard rate and final consumption expenditure. Similarly, CIT Productivity = (CIT Revenue as % of GDP) / (CIT Rate) and PIT Productivity = PIT Revenue in percent of GDP/[(Lowest PIT Rate×Lowest Threshold)+(Highest PIT rate×Highest PIT threshold)/Lowest PIT Threshold+Highest PIT Threshold)].

[5] Similar determinants of revenue efficiency and tax effort are used by Fenochieto and Pessino (2013) and Cevik and others (2019).

$$Tax_{i,t} = \alpha_i + \beta \cdot GovTech_{i,t-1} + \boldsymbol{\theta} \cdot \mathbf{X}_{\boldsymbol{i,t-1}} + u_{i,t} \qquad (1)$$

5. The estimates suggest that there is a positive association between the e-government index and revenue efficiency measures (Table 1). The results hold when control of corruption is used as an additional regressor (columns 2, 4, 6, and 8), though digitalization can also impact revenue efficiency through improving transparency and reducing corruption vulnerabilities. The graph on the right shows the positive association between the fitted values of VAT revenue productivity when plotted against the e-government online service index. Advanced economies tend to have both higher digitalization indices and revenue productivities. Actual VAT revenue productivity is lower than expected based on Bangladesh's government digitalization efforts, which is likely due to presence of multiple reduced VAT rates.

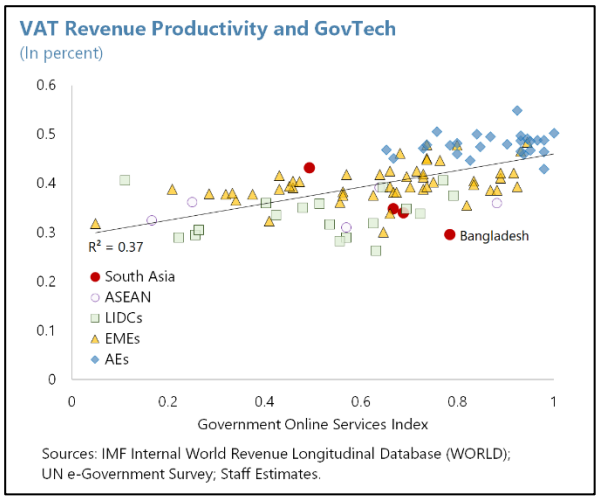
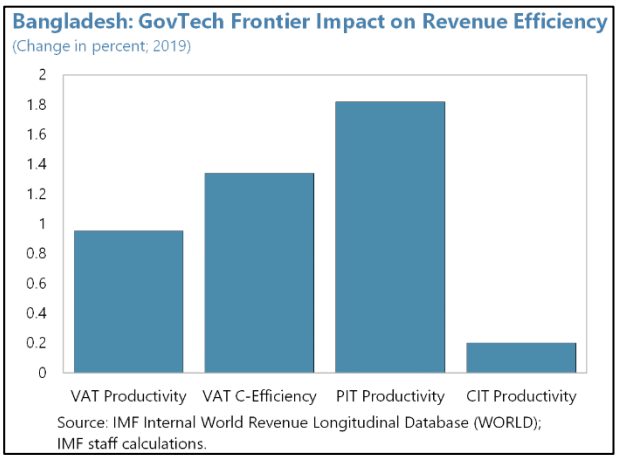


Table 1. Bangladesh: Tax Revenue Efficiency

	(1) VAT Prod.	(2) VAT Prod.	(3) VAT C-Eff.	(4) VAT C-Eff.	(5) PIT Prod.	(6) PIT Prod.	(7) CIT Prod.	(8) CIT Prod.
GovTech Index	0.05**	0.04**	0.06**	0.06*	0.41*	0.42*	0.15*	0.16*
	(0.02)	(0.02)	(0.03)	(0.03)	(0.24)	(0.24)	(0.09)	(0.09)
log GDP per capita	0.05	0.06	0.08	0.08	-0.50	-0.51	0.14	0.12
	(0.05)	(0.05)	(0.08)	(0.08)	(0.75)	(0.76)	(0.54)	(0.54)
log Government Spending (% GDP)	0.08***	0.08***	0.05	0.06	-0.11	-0.10	0.25	0.26
	(0.03)	(0.03)	(0.04)	(0.04)	(0.19)	(0.19)	(0.17)	(0.17)
log Agriculture Value Added (% GDP)	0.00	0.01	-0.05	-0.04	-0.31	-0.33	-0.17	-0.18
	(0.02)	(0.02)	(0.03)	(0.03)	(0.27)	(0.27)	(0.13)	(0.13)
log Trade Openness (% GDP)	0.00	0.00	0.01	0.01	0.37	0.38	0.69***	0.69***
	(0.03)	(0.03)	(0.04)	(0.04)	(0.25)	(0.24)	(0.24)	(0.25)
Telecommunications Index	-0.05	-0.05	-0.12*	-0.13**	-1.01	-1.03	-0.45*	-0.45*
	(0.05)	(0.05)	(0.06)	(0.06)	(0.98)	(1.00)	(0.24)	(0.24)
Human Capital Index	0.02	0.02	0.12*	0.12*	-1.34	-1.33	-0.79	-0.84
	(0.05)	(0.05)	(0.07)	(0.07)	(0.92)	(0.93)	(0.63)	(0.63)
Control of Corruption		0.04*		0.04		-0.12		0.02
		(0.02)		(0.04)		(0.10)		(0.08)
Observations	736	725	717	706	653	641	850	842
Countries	133	131	129	127	125	123	155	153
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.05	0.06	0.06	0.07	0.03	0.03	0.07	0.07

Source: IMF Internal World Revenue Longitudinal Database (WORLD); IMF staff calculations.
Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variables of equations (5)-(8) are specified in logs due to skewness.

6. Bridging the government digitalization divide would result in higher revenue collection efficiency. The estimates of Table 1 suggest that if Bangladesh reached the GovTech frontier (i.e., government online services index equaled one), then revenue efficiency would improve as VAT productivity and VAT C-efficiency measures would increase by about 1 and 1.3 percentage points respectively. Also, PIT and CIT productivity would increase by 1.8 and 0.2 percentage points, respectively. The overall impact on revenue is estimated at about 3 percent of GDP, as the numerators of VAT, CIT and PIT productivity ratios measure the respective revenue shares to GDP.



D. Digitalization and Health Spending Efficiency

7. Can digitalization improve the efficiency of health spending execution? Digital payments and e-procurement have the potential to improve the health budget execution process and simplify the provision and management of public health resources. This section uses a stochastic frontier analysis whereby the health system outcomes of average life expectancy at birth and infant mortality rates ($Health_{i,t}$) are regressed on inputs $\mathbf{X_{i,t-1}}$ such as the level of resources made available and the level of development (equation 2).[6] The compound error term $\varepsilon_{i,t}$ comprises a normally distributed error term $u_{i,t}$, and a disturbance $v_{i,t}$ representing the distance of each country's error term to the frontier (equation 3). The latter is assumed to follow a truncated normal distribution multiplied by a function of time, t, where T_i is the last period observed in the i-th country, η is a decay parameter (equation 4).[7] The estimated time-varying country-specific technical efficiency is obtained via $TE_{i,t} = \exp\{(-v_{i,t})|\varepsilon_{i,t}\}$, and is regressed upon potential determinants of health spending efficiency that include the GovTech index, the telecommunication infrastructure index ($TCom_{i,t}$), and pre-determined variables $\boldsymbol{Z_{i,t-1}}$, such as the level of development, the ratio of births attended by skilled health staff, the urban population share, the income Gini index, and the Universal Health Coverage (UHC) index. Country fixed effects are included to capture the possibility of time-invariant heterogeneity in efficiency (Greene 2004).

$$Health_{i,t} = \alpha_i + \mathbf{X_{i,t-1}} \cdot \boldsymbol{\theta} + \varepsilon_{i,t} \quad (2)$$

$$\varepsilon_{i,t} = u_{i,t} - v_{i,t} \quad (3)$$

$$v_{i,t} = \exp\{-\eta(t - T_i)\} \cdot v_i \quad (4)$$

$$TE_{i,t} = \alpha_i + \beta \cdot GovTech_{i,t} + \gamma \cdot TCom_{i,t} + \boldsymbol{\theta} \cdot \mathbf{Z_{i,t-1}} + u_{i,t} \quad (5)$$

[6] Grigoli and Kapsoli (2018) discuss the advantages of stochastic frontier analysis in estimating health spending efficiency.

[7] See Battese and Coelli (1992) for further details on the estimation procedure used.

Table 2. Bangladesh: Stochastic Frontier Analysis: Health Spending Efficiency

	Frontier Equation							
	Life Expectancy				Infant Mortality			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
log Total Health Spending per capita	-0.00	-0.00	-0.00	-0.00				
	(0.00)	(0.00)	(0.00)	(0.00)				
log GDP per capita	0.02***	0.02***	0.02***	0.02***				
	(0.00)	(0.00)	(0.00)	(0.00)				
log Total Health Spending per capita					-0.06***	-0.06***	-0.06***	-0.06***
					(0.01)	(0.01)	(0.01)	(0.01)
log GDP per capita					-0.34***	-0.34***	-0.34***	-0.34***
					(0.02)	(0.02)	(0.02)	(0.02)
Observations	1204	1204	1204	1204	3378	3378	3378	3378
	Efficiency Equation							
GovTech Index	0.02***	0.02***	0.01***	0.01***	-0.10***	-0.09***	-0.00***	-0.00***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)
Telecommunications Index	0.06***	0.06***	0.02***	0.00	-0.25***	-0.23***	-0.00***	0.00
	(0.01)	(0.01)	(0.00)	(0.01)	(0.02)	(0.03)	(0.00)	(0.00)
log GDP per capita		0.02*	0.02***	0.01		-0.07	-0.00***	0.00
		(0.01)	(0.01)	(0.01)		(0.05)	(0.00)	(0.00)
Skilled Health Staff			0.00***	0.00			-0.00**	-0.00**
			(0.00)	(0.00)			(0.00)	(0.00)
log Urban Population Rate			0.16***	0.07			-0.01***	-0.00**
			(0.02)	(0.04)			(0.00)	(0.00)
UHC Index				0.00**				-0.00**
				(0.00)				(0.00)
Gini Index				-0.00*				0.00
				(0.00)				(0.00)
Observations	1204	1204	611	106	1253	1253	629	106
Countries	173	173	159	68	180	180	163	68
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.40	0.42	0.69	0.75	0.42	0.44	0.71	0.76

Source: IMF staff calculations.
Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variables are expressed in logs.

8. The results suggest that both government digitalization, as well as telecommunication infrastructure quality are positively correlated with the estimated efficiency in health spending (Table 2). All else equal, better e-government services are associated with higher efficiency of health spending in increasing life expectancy and lower inefficiency of health spending in reducing infant mortality. Higher GDP per capita and higher health spending are associated with better health outcomes (frontier equation). Health systems tend to be more efficient in countries that are more developed, have less income inequality, or have a greater share of their population living in urban areas (efficiency equation). Also, health

spending efficiency is higher for countries that deploy more skilled health staff to attend births or cover a greater share of essential health services as proxied by the UHC index.[8]

E. Digitalization and Education Spending Efficiency

9. Are e-governments better at providing access to education? Digital approaches to remote learning during the pandemic underscored the need to promote e-education along with e-government. In this section we examine whether e-governments tend to be more efficient in administering education spending to achieve better education outcomes. The stochastic frontier analysis described in the previous section is used with education spending per capita and GDP per capita as the main inputs to generate education outcomes such as school enrollment in secondary, upper secondary and tertiary education ($Education_{i,t}$ variable in equation 6). The estimation is carried out following a similar structure to equations (3)-(5). The technical efficiency estimates obtained from equation (6) are regressed upon determinants of education spending efficiency that include the GovTech index, the telecommunication infrastructure index, the level of development, the share of the population with access to basic sanitation, the urban population share, and the income Gini index.[9]

$$Education_{i,t} = \alpha_i + \mathbf{X_{i,t-1}} \cdot \boldsymbol{\theta} + \varepsilon_{i,t} \qquad (6)$$

10. Countries with stronger e-governments tend to have higher efficiency of education spending in enrolling secondary, upper secondary, and tertiary students (Table 3). Gross enrollment rate refers to the ratio of total enrollment to the population of the age group that officially corresponds to the level of education shown. Higher education spending and level of development are associated with better education outcomes. More advanced government digitalization is correlated with lower inefficiency in education spending for a given level of development and telecommunication infrastructure. The results are less strong for primary education students, where countries have already achieved higher enrollment rates. More urbanized countries with better access to basic sanitation services tend to have better education spending efficiency.

F. Conclusion

11. Scaling up the use of GovTech solutions in Bangladesh's public administration offers significant potential in transforming service delivery and mobilizing resources. Countries with more digitalized government services tend to have higher efficiency in generating fiscal revenue and achieving higher outcomes from their health and education spending. The COVID-19 pandemic has accelerated the e-government transition that was already underway in Bangladesh. However, to reap the full dividends of the GovTech revolution, it is important that institutional

[8] The results are in line with the Data Envelopment Analysis (DEA) of Garcia-Escribano, Juarros, and Mogues (2021) who also document that increasing UHC coverage improves health spending efficiency.

[9] See Grigoli (2014), Herrera and Pang (2005), Herrera and Abdoulaye (2018) and Wagstaff and Wang (2011) for including similar determinants of education spending efficiency.

frameworks are in place to safeguard against risks related to cybersecurity, digital exclusion, fraud, and privacy infringement.

Table 3. Bangladesh: Stochastic Frontier Analysis: Education Spending Efficiency

	Secondary			Upper Secondary			Tertiary		
Frontier Equation									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
log Education Spending per capita	0.03	0.03	0.03						
	(0.02)	(0.02)	(0.02)						
log GDP per capita	0.19***	0.19***	0.19***						
	(0.02)	(0.02)	(0.02)						
log Education Spending per capita				0.02	0.02	0.02			
				(0.04)	(0.04)	(0.04)			
log GDP per capita				0.35***	0.35***	0.35***			
				(0.04)	(0.04)	(0.04)			
log Education Spending per capita							0.15***	0.15***	0.15***
							(0.04)	(0.04)	(0.04)
log GDP per capita							0.40***	0.40***	0.40***
							(0.06)	(0.06)	(0.06)
Observations	531	531	531	535	535	535	518	518	518
Efficiency Equation									
GovTech Index	0.04***	0.02**	0.01*	0.04***	0.03**	0.02**	0.04***	0.02*	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Telecommunications Index	0.06***	0.03	-0.03	0.09***	0.05**	-0.01	0.10***	0.06**	0.04**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)
log GDP per capita		0.07**	0.07***		0.08**	0.08**		0.09***	0.09***
		(0.03)	(0.02)		(0.03)	(0.03)		(0.02)	(0.02)
log Urban Population Rate			0.06			0.16			0.00
			(0.13)			(0.12)			(0.07)
Gini Index			0.00			0.00			0.00
			(0.00)			(0.00)			(0.00)
Basic Sanitation			0.08***			0.08***			0.06**
			(0.02)			(0.03)			(0.02)
Observations	152	152	53	152	152	53	114	114	39
Countries	28	28	20	28	28	20	21	21	14
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.50	0.59	0.84	0.57	0.66	0.89	0.70	0.81	0.93

Source: IMF staff calculations.
Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variables are expressed in logs.

Table 4. Bangladesh: Data Sources

Variable	Data Source
Agriculture, forestry, and fishing, value added (% of GDP)	WB: World Development Indicators Database
Births attended by skilled health staff (% of total)	WB: World Development Indicators Database
CIT/PIT/VAT Rates or Thresholds	IMF: FAD Tax Rates Database Revenue
CIT/PIT/VAT Revenue	IMF: World Economic Outlook Database
CIT/PIT/VAT Revenue Indicators	IMF: World Revenue Longitudinal Database (WORLD)
Control of Corruption	WB: World Governance Indicators
Domestic General Government Expenditure on Health per capita in PPP international dollar	WB: World Development Indicators
Domestic Private Health Expenditure on Health per capita in PPP international dollar	WB: World Development Indicators
Education spending per capita	WB: World Development Indicators
e-Filing/e-Payment/CMIS/TMIS/TSA/Payroll System Indicators	WB: Digital Government/GovTech Systems and Services (DGSS) Database
Exports of Goods and Services	IMF: World Economic Outlook Database
GDP per capita	IMF: World Economic Outlook Database
Gini Index	WB: World Development Indicators
Government Expenditure	IMF: World Economic Outlook Database
Health Spending per capita	WB: World Development Indicators
Imports of Goods and Services	IMF: World Economic Outlook Database
Online Services Index	UN: E-Government Survey
Population density (people per square kilometers of land area)	WB: World Development Indicators
Pupil Teacher Ratio	WB: World Development Indicators
People using at least basic sanitation services (% of population)	WB: World Development Indicators
Telecommunications Infrastructure Index	UN: E-Government Survey
Universal Health Coverage Index	WB: World Development Indicators

Note: UN = United Nations; WB = World Bank; VAT = value-added tax; CIT = Corporate Income Tax; PIT = Personal Income Tax; VAT=Value Added Tax; CMIS = Customs Management Information System; TMIS = Tax Management Information System; TSA = Treasury Single Account; GDP= Gross Domestic Product.

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MODERNIZING THE MONETARY POLICY FRAMEWORK IN BANGLADESH – MODEL-BASED INSIGHTS[1]

We have developed a semi-structural Quarterly Projection Model (QPM) for Bangladesh and use it to assess the country's macroeconomic volatility and policy options under different monetary and exchange rate regimes, ranging from the existing framework, characterized by a variety of monetary targets and instruments and a closely managed currency, to a full-fledged Inflation Targeting (IT) with a flexible exchange rate. Model-based results and counter-factual historical simulations suggest that adopting a well-managed and credible IT regime can lead to a sizeable reduction in macroeconomic volatility (and therefore lower investor uncertainty and higher potential growth in the medium term). At the same time, our analysis emphasizes that any such transition to IT must be a comprehensive exercise —involving modernization to the way the monetary policy decisions are formulated, implemented, and communicated — and cautions against half measures and shortcuts in the policy regime switch as these could undermine the central bank's credibility and lead to increased vulnerabilities.

A. Monetary Policy in Bangladesh

1. Bangladesh Bank's (BB) monetary policy is designed with the objective of fostering price stability while supporting economic growth.[2] The Ministry of Finance and Bangladesh Bank together form yearly targets for GDP growth and inflation. To achieve these objectives, BB's intermediate target is broad money (M2) and the operational target is reserve money.

2. BB has been working toward the objective of modernizing monetary policy and moving toward an inflation targeting (IT) regime in the long term with the transitional objective of setting up a flexible monetary targeting (FMT) regime. Under FMT, reserve money would be replaced by the short-term interest rate as the operating target. This would help operationalize the interest rate corridor and strengthen monetary policy transmission through the interest rate channel and go toward helping prepare BB for the eventual move to an IT regime.

3. The transition to IT is a multifaceted process requiring simultaneous and comprehensive adjustments to the way monetary policy decisions are formulated, implemented, and communicated. Announcement of the policy regime switch alone, without simultaneously modernizing the monetary policy framework, is not sufficient for a successful transition. Lack of reforms to central bank governance, monetary policy transparency, analytical and forecasting capacities, monetary operations, and communications, or half measures thereof, can

[1] Prepared by Racha Moussa (APD), Iaroslav Miller and Yaroslav Hul (both ICD).

[2] Though this is not explicitly the mandate according to the Bangladesh Bank Order, it is stated in the published Monetary Policy Statements.

undermine trust in the monetary authority and result in increased uncertainty and volatility in the economy.

4. This paper examines the benefits and tradeoffs of the monetary regime switch using a semi-structural QPM for the Bangladeshi economy. First, we modify a canonical QPM as in Berg et al. (2006) to capture distinctive characteristics of the Bangladeshi economy and show that both the model's fit to the historical data and the model's forecast properties are satisfactory. Second, we examine two alternative policy scenarios reflecting two different ways of transitioning to an IT, and their disparate impact on macroeconomic volatility — "Uncommitted Regime Switch (URS)" scenario analyzes the consequences of an ill-managed transition, and "Credible Inflation Targeting (CIT)" scenario examines the benefits of a comprehensive transition to IT. Third, by using these two alternative model specifications we conduct counterfactual simulations of the policy response to the exchange rate devaluation of 2011 — to demonstrate potential macroeconomic benefits of a comprehensive IT framework during the times of crisis.[3]

B. A QPM for Bangladesh

5. To facilitate monetary policy analysis and examine the tradeoffs between different monetary policy regimes, we developed a semi-structural QPM model that reflects closely the structure of the Bangladeshi economy. To capture the unique features of the economy, we modified the canonical QPM model:[4]

I. The food and nonfood inflations are modelled separately to reflect different dynamics of the two components and better capture their long-term relationship through the relative prices.

II. The real GDP is split into agricultural and non-agricultural components, that are modeled separately. The output gap, a proxy for domestic demand pressures, is based on a non-agricultural GDP component, while agricultural GDP serves to proxy supply-side (essentially, crop harvest) pressures on food inflation. This allows us to capture a stylized fact of the Bangladeshi economy that a bumper harvest which creates excess supply of domestically produced food products (e.g., rice) would create a downward pressure on food-price inflation.

III. To reflect the importance of money targeting in the existing policy framework, we allow the money quantities to have a direct effect on interest rates in the model.

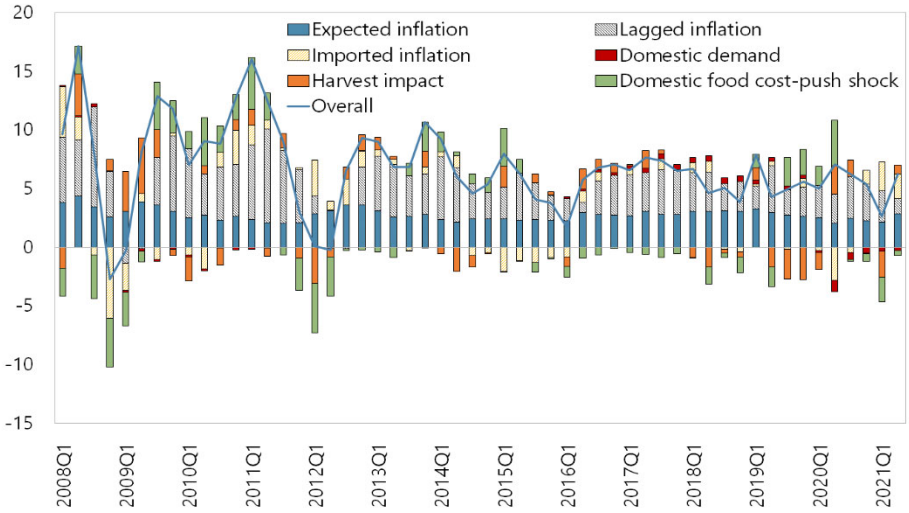
IV. To reflect observed smoothness of the nominal exchange rate, we allow it to deviate from the pure uncovered interest parity (UIP) condition, and instead allow exchange rate expectations to

[3] Henceforth, we use the term "comprehensive IT" to refer to a flexible inflation-forecast targeting (IFT) framework as described in Svensson (2010) and Clinton et al. (2015), among others. In particular, under such IT framework, *"central banks [...] not only aim at stabilizing inflation around the inflation target but also put some weight on stabilizing the real economy..."* (Svensson, 2010, p.1)

[4] Please see Berg et al. (2006) for the details of a canonical QPM model

be partially backward looking. The rate of nominal depreciation in the long term is made consistent with the relative purchasing power parity (PPP) condition.

Figure 1. Drivers of Food Inflation
(SA, In percent, Q-o-Q Annualized)



Source: Bangladesh Bureau of Statistics; Bangladesh Bank; Haver Analytics; and IMF staff calculations.

Table 1. Bangladesh: Ratio of Root Mean Square Error (RMSE) of the QPM-Based Forecasts Compared to the Random Walk (RW)
(Values below 1 indicate that the QPM outperforms random walk; the smaller the ratio the better the QPM predicts the variable compared to the random walk)

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Real NonAgricultural GDP Growth (% YoY, log approx)	0.68	0.67	0.68	0.72	0.84	0.85	0.84	0.84
Real Agricultural GDP Growth (% YoY, log approx)	0.62	0.47	0.41	0.40	0.59	0.63	0.65	0.66
Nominal Interbank Interest Rate (% pa)	1.32	1.01	0.96	0.91	0.87	0.79	0.79	0.77
Nominal Exchange Rate Depr. (% YoY, log approx)	0.60	0.60	0.60	0.61	0.55	0.54	0.56	0.60
Headline CPI Inflation (% YoY, log approx)	0.60	0.63	0.64	0.65	0.65	0.66	0.69	0.64
Food CPI Inflation (% YoY, log approx)	0.51	0.49	0.49	0.47	0.45	0.46	0.48	0.50
ExFood CPI Inflation (% YoY, log approx)	0.70	0.68	0.67	0.65	0.59	0.56	0.58	0.59

Source: Bangladesh Bureau of Statistics; Bangladesh Bank; and IMF staff calculations.

6. The model can explain historical data well and produces high precision of (pseudo) out-of-sample forecasts. By extension model structure reflects reasonably well the current monetary policy regime where money targeting plays a dominant role in the economic management. Figure 1 shows an example of a good model fit, whereby food inflation dynamics (excluding the effect of partly backward-looking expectations) is predominantly driven by the harvest performance and imported inflation, while domestic demand has only marginal impact. Table 1 demonstrates that QPM-based historical forecasts outperform comprehensively the random

walk forecasts both in the short term (1-2 quarters ahead; except for nominal interest rates) as well as over the medium term (3+ quarters ahead).

C. Transitioning to Inflation Targeting

7. The benefits of transitioning to an inflation targeting regime depend on several factors. Economic theory and historical case studies suggest that a well-managed and comprehensive inflation targeting regime leads to well-anchored inflation expectations, low and stable inflation, and predictable interest rates, and thus notably reduces investor uncertainty and volatility of economic output. This is usually in stark contrast to more eclectic monetary regimes, which are frequently centered around traditional money targeting (but typically involve also multiple other conflicting targets and instruments), are opaque and inconsistent, and are often badly understood by the market participants.[5] Transitioning from such regimes to an inflation targeting is a multifaceted process requiring simultaneous and comprehensive adjustments to the way monetary policy decisions are formulated, implemented, and communicated. In other words, as much as such transition is a desired outcome, simply announcing a switch to an inflation targeting regime without a parallel ongoing modernization to the monetary policy framework[6], or implementing half measures (which is often even worse), could lead to a plethora of undesired outcomes, including a deterioration in the stability of economy compared to the original eclectic regime.

8. To study the consequences of an ill-managed policy switch and the benefits of a comprehensive inflation targeting we use two alternative policy scenarios. The *"Uncommitted Regime Switch" (URS)* scenario describes the case when a monetary authority announces a switch to an inflation targeting only nominally — it adopts interest rate as the main operational target and allows more flexibility in the exchange rate but at the same time doesn't contemporaneously advance on related policy reforms, such as strengthening monetary policy formulation function, strengthening of the interest rate transmission channel, and improving policy transparency and communications. This results in a situation where economic rigidities remain significant as the expectations of economic agents stay largely backward looking and not anchored by the inflation target. The second scenario, *"Credible Inflation Targeting" (CIT),* describes the case when a central bank has successfully transitioned to a comprehensive inflation targeting, — with a transparent inflation forecast as an intermediate target and a forward-looking policy interest rate as an operational target, and where inflation expectations become better anchored over a medium term on the back of consistent and credible monetary policy.

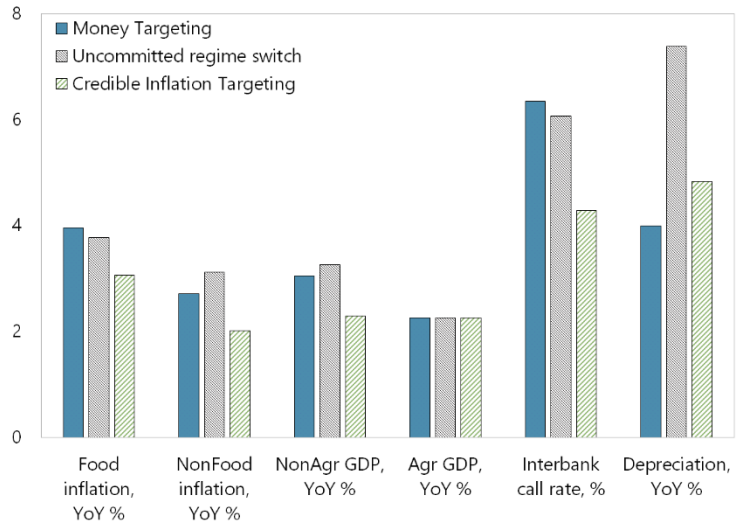
9. Model-implied standard deviations of the main macroeconomic variables suggest that URS may not automatically lead to better outcomes (Figure 2). The *URS* scenario illustrates a cautionary tale that simply announcing IT regime without doing proper related reforms (to the policy framework, operations, and communications) could lead to mixed results as the exchange

[5] Please see IMF 2015 for a more detailed discussion on the subject.

[6] Including strengthening of de-facto central bank independence, governance, and transparency, enhancing analytical and decision-making capacity, streamlining monetary operations, developing money markets, and improving policy communications.

rate volatility increases along with the volatility of other variables, namely non-food inflation and non-agricultural GDP. In contrast, the *CIT* scenario shows that if the transition to IT is comprehensive and the monetary policy is transparent and consistent in what it does and communicates, the economic agents over time become more forward looking and all variables decrease in volatility. This reflects the fact that market expectations under credible IT become much better anchored and forward-looking, rendering shocks more short-lived and smaller in magnitude, and requiring less frequent monetary policy reaction.

Figure 2. Model Implied Standard Deviations Under Different Policy Regimes



Source: IMF staff calculations (model implied results).

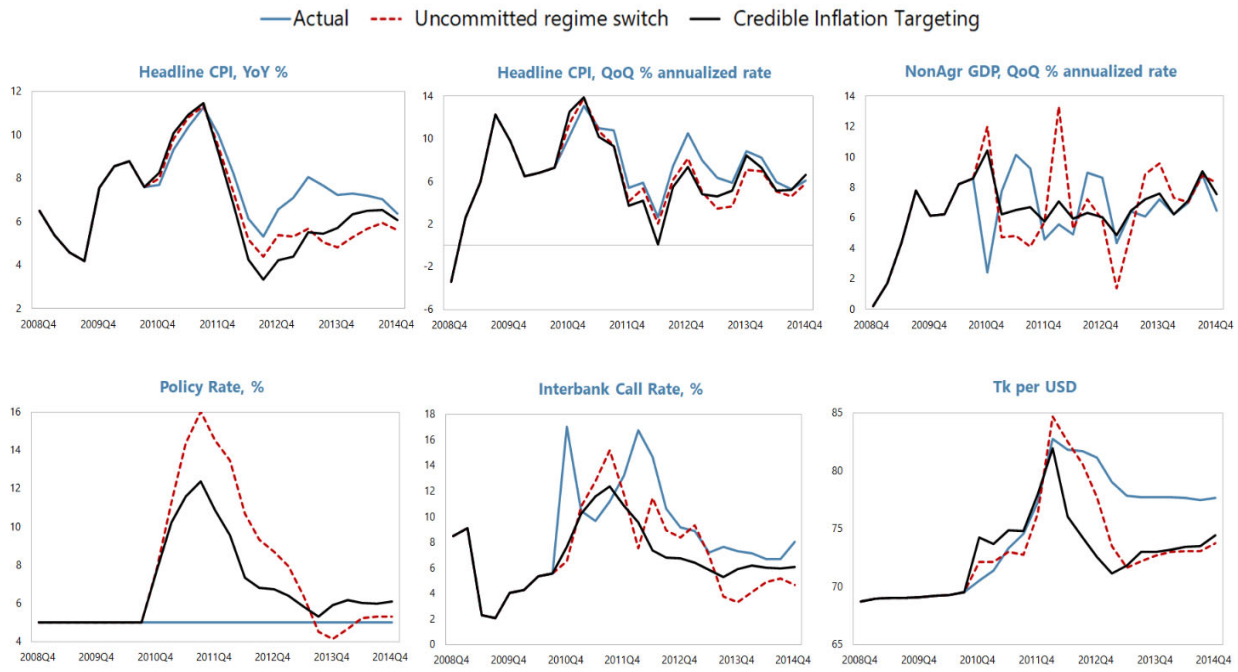
D. Counterfactual Simulation

10. To strengthen the theoretical findings, counterfactual simulations of policy responses to the historical exchange rate pressures of 2011 under the two hypothetical regimes are compared with the actual data (Figure 3). This comparison demonstrates that under *CIT* the exchange rate would have been allowed to depreciate and the central bank would have reacted strongly to increasing inflationary pressures by hiking the policy rate. This would have helped curb domestic demand and stem depreciation. As soon as inflationary pressures dissipated the central bank would have started easing the monetary stance. Owing to a well-functioning operational framework, the interbank rate would have remained closely aligned with the policy rate keeping its trajectory relatively much more stable and smoother compared to the actual data from the time. Swift and decisive reaction by the central bank would have also allowed for less volatile GDP growth.[7] The stability of GDP growth under the *CIT* would have led to a higher cumulative output over time — e.g., by the end of 2014 the level of GDP would have been about 1 percent higher than the realized one. In contrast, ill-managed and half-measured IT regime, as described by the *URS*

[7] We observe only the available annual GDP as input into the model, but it is then interpolated into the quarterly series based on the model structure and calibration and is informed by the available data on other variables.

scenario, would have required a much more severe policy hike to curb inflationary pressures and would have led to a higher volatility in GDP growth and exchange rate, without the benefit of an interbank interest rate stability.

Figure 3. Counterfactual Simulation



Source: Bangladesh Bureau of Statistics; Bangladesh Bank; and IMF staff calculations.

E. Conclusion

11. Modern economic policy consensus agrees that adopting a comprehensive IT framework can be particularly beneficial for small open economies integrated into global markets. Our analysis demonstrates that this is the case for Bangladesh too, especially as it graduates from the LDC category and becomes more closely integrated into the global financial system. Our analysis using a QPM, tailored to the characteristics and stylized facts of the Bangladeshi economy, shows that adopting a comprehensive IT framework would allow Bangladesh to achieve a higher level of macroeconomic stability and be better equipped to deal with external shocks, which will become more frequent and intense as Bangladesh graduates from LDC. The analysis also highlights the risks of an ill-managed transition to IT, which could result in higher volatility, weaker policy transmission, increased vulnerability to external shocks, and consequently lower growth. Therefore, a transition to IT should be underpinned by a comprehensive set of reforms, including strengthening of the central bank's independence and governance, enhancing its analytical and forecasting capacity, streamlining operational framework, developing money markets, and improving policy communications.

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PREPARING FOR AUTOMATION: THE CASE OF BANGLADESH[1]

Around 60 percent of the labor force in Bangladesh is employed in industries at a high risk of automation. Furthermore, automation in advanced economies will lead to the "onshoring" of manufacturing activities that were offshored to other countries. This is a critical time for Bangladesh, and every effort must be made to upgrade the RMG sector and keep it competitive. This includes increasing the technology used in factories, upgrading the skills of workers, and improving logistics, including transportation. Efforts to increase skills are complementary to policies needed in response to automation which center on upgrading the skills of labor through education and training.

1. The fear of machines replacing humans has existed for arguably 500 years. Queen Elizabeth I denied a patent for an automated knitting machine for fear that it would replace the jobs of women.[2] The fundamental dilemma remains relevant to this day: if machines can replace people, what would be left for people to do?

2. The heightened concern about automation's impact on employment has picked up in recent years. A confluence of factors is responsible for this: a decline in the labor share of income and an increase in the concentration of wealth; the hollowing out of the middle class; and the offshoring of manufacturing jobs. Also, between 2013 and 2018 the stock of industrial robots increased by more than 80 percent and projections suggest that the stock will increase a further 60 percent by 2022 (IRF, 2019).[3] Manufacturing jobs are not the only jobs at risk of automation. Artificial Intelligence (AI) and computer programs have been automating mental tasks, and advances in these technologies are expected to reach jobs previously thought to be immune to automation (for example, driverless cars).

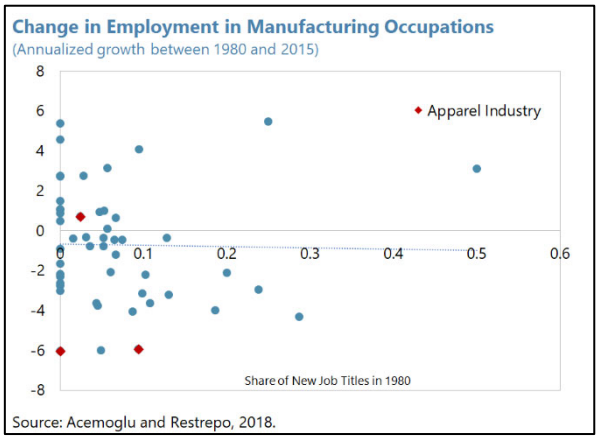
3. History has shown that along with automation comes innovation and new jobs. Since the industrial revolution, new industries and new jobs were born alongside the disappearance of some. Acemoglu and Restrepo (2018) study automation in a theoretical setting where tasks carried out by labor can be automated, and new tasks in which labor has a comparative advantage can arise. They describe the conditions under which a balanced path where both automation and the emergence of new tasks co-exist. Using data from the United States they find that occupations with a higher proportion of new titles, which proxy new tasks, have growth in employment going forward. Of course, this means that workers' skills will have to keep up with learning new skills and moving to new jobs. In the case where new tasks are performed by high skilled labor, both automation and the emergence of new tasks would increase inequality unless low-skilled workers can learn the new tasks. Between 1980 and 2015, employment growth in manufacturing has been shrinking with occupations in the apparel industry among those contracting the most. Conversely,

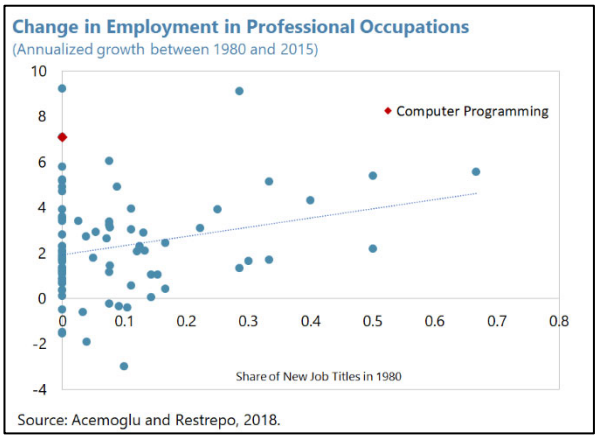
[1] Prepared by Racha Moussa (APD).

[2] https://qz.com/1019145/weve-been-worrying-about-the-end-of-work-for-500-years/

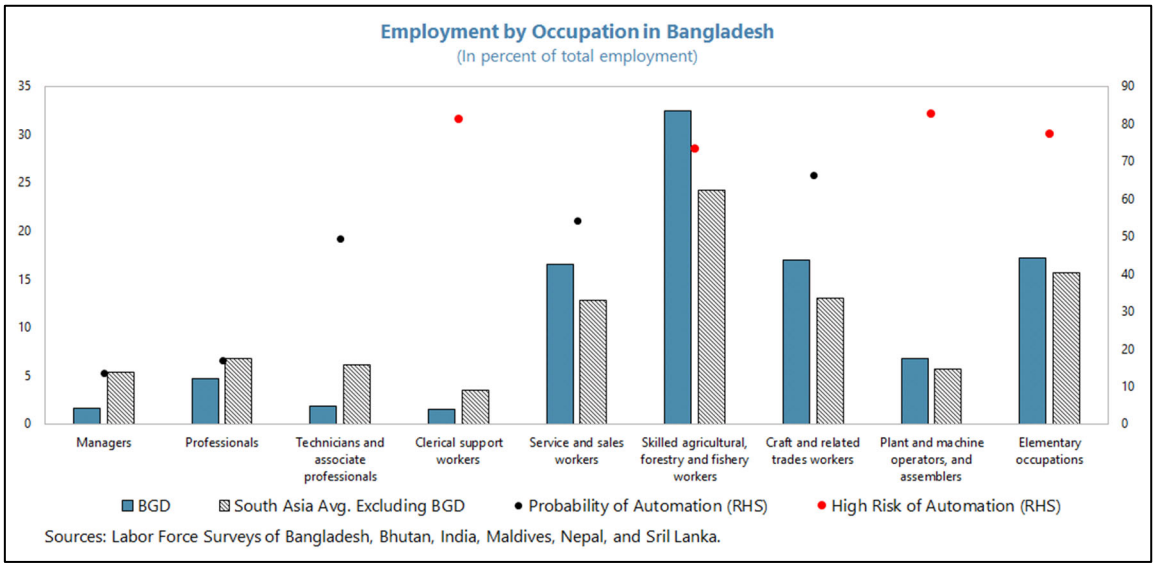
[3] https://ifr.org/downloads/press2018/IFR%20World%20Robotics%20Presentation%20-%2018%20Sept%202019.pdf

professional occupations such as engineers, scientists, teachers, and healthcare professionals have seen growth in employment during the same time.





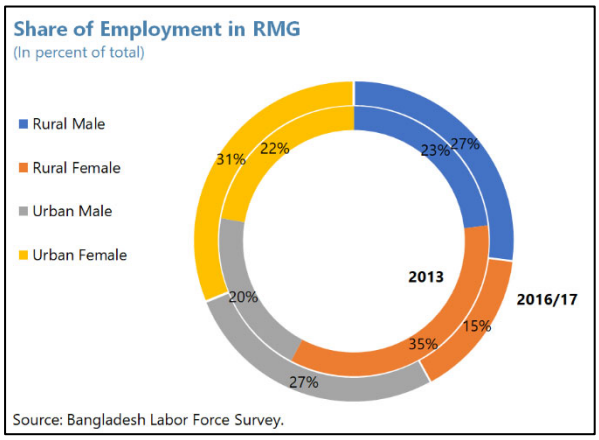
4. Around 60 percent of the labor force in Bangladesh are employed in industries that are at a high risk of automation (above 70 percent). This estimate is obtained by using the probabilities of automation estimated in Frey and Osborne (2013) and applying them to the occupational categories in Bangladesh. As the data on employment from the 2016/17 labor force survey (LFS) is only available for single digit occupations, the calculation uses average over the probabilities of automation in Frey and Osborne (2013) which are estimated by 4-digit occupation codes. It's important to highlight that occupations in the RMG industry vary in their risk of being automated, with weaving and knitting machine operators having higher risk of automation than patternmakers.[4] Bangladesh is more vulnerable to automation than other south Asian economies given the greater role manufacturing plays in the economy.

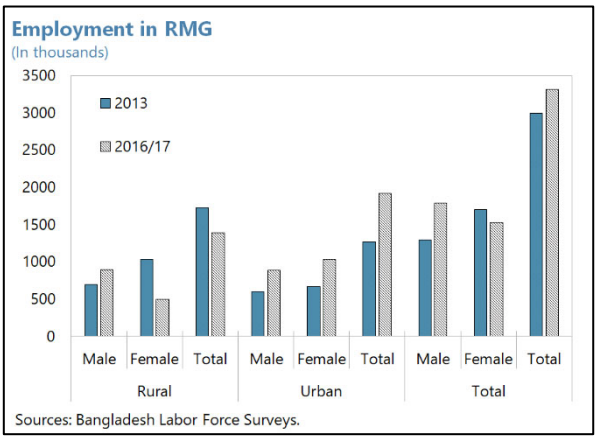


[4] The LFS of 2016/17 does not provide data on employment in these specific occupations.

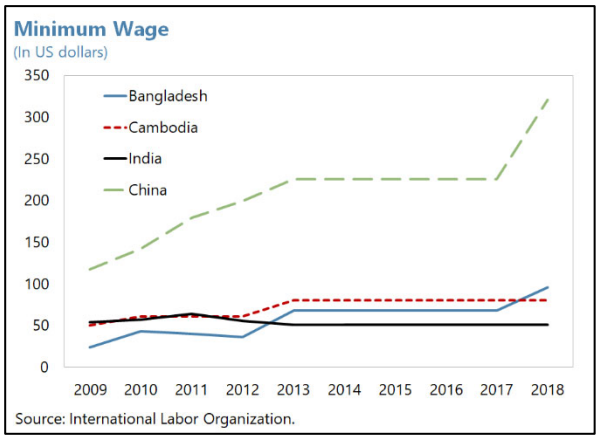
5. Understanding the impact of automation on the manufacturing industry and the ready-made garment (RMG) industry more specifically is critical to understanding prospects of employment and production in Bangladesh. For the past two decades, manufacturing has been an important driver of growth in Bangladesh has had the largest contribution to growth. In the last 5 years, manufacturing contributed to more than one third of GDP growth. Within manufacturing, the RMG industry is an important component and makes up more than 90 percent of the value of exports.

6. Employment in the garment industry in Bangladesh has increased by 10 percent between the last two labor force surveys, 2013 and 2016/17. This increase is driven by a 40 percent increase in male employment in the industry contrasted with a ten percent decline in female employment. The decline in female employment is explained by the decline in employment for females in rural areas—female employment in rural areas declined by 50 percent between 2013 and 2016/17 LFS. Females in rural areas comprised 15 percent of the RMG labor force in 2016/17 compared to 35 percent in 2013. Employment in RMG from labor in urban areas increased to 58 in 2016/17 compared with 42 percent in 2013. This trend could be caused by an increase in salary from working in RMG. In November 2013 the minimum wage was increased from Tk 3000 to Tk 5300, which was further increased to Tk 8000 in September 2018. However, the impact of this increase on employment in the RMG sector could be studied only after the next LFS. An increase in automation is cited as one of the major reasons for the decline in female employment in the RMG industry. Women tend to have lower skills and cannot operate various types of machines (CPD, 2019). It is critically important to ensure that workers in RMG continue to improve their skills so that they will be able to operate more sophisticated machinery which will increase productivity.

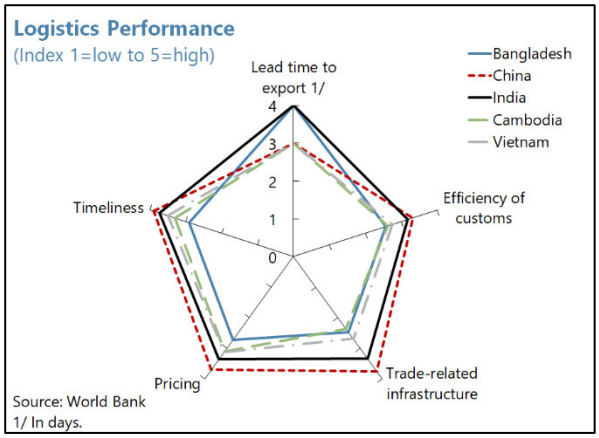




7. The RMG industry in Bangladesh will need to be competitive without reliance on low wages. Minimum wages in Bangladesh are no longer below peers. The strategy to maintain competitiveness must rely on improvements in productivity and increasing the quality of products. This will require improving the skill of labor and moving into the production of higher value-added goods. Continued emphasis on diversifying the exports in Bangladesh remains a key policy issue. In addition to this, increasing the competitiveness of the RMG sector in Bangladesh is important in the transition, as the sector is currently an important driver of the economy.



8. RMG in Bangladesh is largely centered on the production of low-value added cotton garments sold to fast fashion retailers. This makes the sector particularly vulnerable to two emerging risks. First, the increase in onshoring in advanced economies, such as the US, which will start to occur at the lower end of the value-added chain first. Onshoring efforts in the United States have begun.[5,6] A factory in Arkansas is planned to test production relying on "Sewbots" which perform the entire task of making an item of clothing from cutting the fabric to assembly to finishing, in the second quarter of 2020. This includes t-shirts which is a major export from Bangladesh.[7] This type of complete automation is at the experimental stage and by some estimates about a decade away from being mainstreamed (Nikkei, 2019).[8] Humans are still needed in the process, but they are becoming more tasked with technical things related to the operation of machinery or finishing details that require human nimbleness and skill. To remain competitive, it is imperative that Bangladesh improve the quality of the goods in the RMG sector, move further into producing higher value-added goods which require more skills to make, such as knits and clothing made from synthetic fabrics. This will require making sure that factories have updated technologies and that workers have the skills required to produce higher value-added goods. Second, the changing nature of the Fast Fashion industry which has become more demanding of faster delivery times to supply trends on-demand (Nikkei, 2019). For Bangladesh to remain



[5] Onshoring refers to the domestic return of activities that were previously outsourced to other countries.

[6] https://www.trtworld.com/magazine/will-robots-completely-replace-humans-from-textile-factory-floors--14930

[7] https://www.just-style.com/news/tian-yuan-garments-invests-another-10m-in-us-facility_id136381.aspx

[8] https://asia.nikkei.com/Spotlight/Cover-Story/How-the-death-of-fast-fashion-is-transforming-Asia-s-garment-industry

competitive, logistics postproduction should be at par with the competition. Currently Bangladesh underperforms main competitors in the region.

9. Automation will inevitably decrease the intensity of labor in the RMG sector if the sector remains globally competitive. Estimates by the ILO suggest that around 60 percent of Jobs in the RMG sector may be lost by 2041 (ILO, 2019). This is a critical time for Bangladesh, before onshoring in advanced economies picks up, and every effort must be made to upgrade the RMG sector and keep it competitive. This includes increasing the technology used in factories, upgrading the skills of workers, and improving logistics, including transportation. Efforts to increase skills are complementary to policies needed in response to automation which center on upgrading the skills of labor through education and training.

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BANGLADESH IN TRANSITION[1]

Bangladesh, a lower middle-income country (LMIC), met the Least Developed Country (LDC) graduation thresholds twice – in 2018 and again in 2021 – and is expected to graduate from LDC status by 2026. Key external drivers that helped achieve this transition—robust exports and worker's remittances—have plateaued. New challenges – including potential loss of benefits of LDCs, such as preferential tariff status (particularly duty-free quota-free access to EU markets) and access to other International Support Measures (ISMs) including specialized and differential treatment regarding WTO regulations—have emerged. Bangladesh starts its journey towards LDC graduation on a weaker footing compared to the countries that successfully graduated. Gaps remain in the scale and diversification of exports, levels of domestic trade protection, foreign direct investment (FDI) inflows, size of tax revenue mobilization as well as vibrancy of the investment climate. Failing to address these gaps may result in Bangladesh falling behind its targets to reach UMIC and high-income country (HIC) status, in 2031 and 2041, respectively. The analysis suggests that key to enhancing export performance are improving competitiveness through short-run exchange rate flexibility and longer run export diversification supported by revenue mobilization, lowering of customs and other import duties among other structural factors, which impact the investment climate adversely. Revenue mobilization, capital account openness and trade openness also seem to matter for strengthening FDI inflows. These findings are in line with the recommendations of the 8th five-year plan (FYP).

A. Background

1. Bangladesh became a LMIC in 2015, reaching US$ 1220 GNI per capita.[2] After the expected LDC graduation in 2026, Bangladesh aims to reach UMIC and HIC status, in 2031 and 2041, respectively (GED, 2020). How can Bangladesh achieve these goals? Exports and foreign direct investment (FDI) have been the major external growth drivers for LMICs and UMICs, and especially for countries that have graduated to UMICs and HICs. Bangladesh seems to be lagging on many of the external drivers including on factors that drive them. (Table 1). Bangladesh's main growth drivers have been RMG exports – which constitute more than 80 percent of total exports— and worker's remittances[3]. While export diversification remains a key challenge[4], remittances – where Bangladesh seems to be ahead of its peer group – are also naturally expected to taper with transition to higher income levels.

[1] Prepared by Muhammad Imam Hussain (Binghamton University) and Ritu Basu (APD).

[2] In World Bank's Atlas method (current US$). Bangladesh reached GNI per capita US$ 2010 in 2020. Currently, UMIC GNI per capita threshold ranges from US$ 4,096 to US$ 12,695 (World Bank, 2022a, 2022b).

[3] Data Source: Export Promotion Bureau (EPB), Bangladesh Bank, Bangladesh.

[4] See also IMF 2021.

Table 1. Five-Year Average Ratio of Bangladesh and LMICs (During 2013–2017), and UMICs and HICs During their Five-Year Transition Period 1/

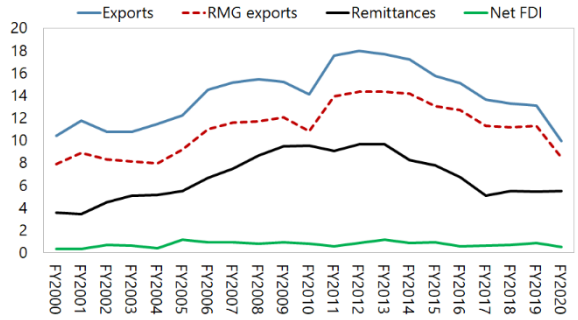
	Bangladesh	Median ratio of all LMICs	Median ratio of LMICs in transition to UMICs 2/	Median ratio of UMICs in transition to HICs 2/
Trade to GDP ratio	39.9	76.8	93.7	90.4
Exports to GDP ratio	17.1	33	38.5	41.3
Export diversification (Theil index) 3/	4.9	3.8	3	2.3
Gross FDI to GDP ratio	1.2	2.5	4.2	7
Net remittance inflows to GDP ratio	6.9	2.3	2.3	0.1
Customs and other import duties to tax revenue ratio	27.6	10.7	8.3	2.7
Tax to GDP ratio	8.6	16.2	19.4	20.5

Sources: Financial Flow Analytics and WEO Database, Export Diversification Database, IMF; World Development Indicators, World Bank; and IMF Staff estimates.
1/, 2/, 3/, see Appendix for data notes for Table 1.

B. Recent Developments

2. In the past two decades (FY2001–FY2020), real GDP growth of Bangladesh averaged 6.2 percent per year, and poverty declined from 48.9 percent in 2000 to 24.3 percent in 2016. [5, 6] Growth was propelled by Ready-Made Garments (RMG) exports and remittances and supported by macro stability – low inflation and fiscal prudence (Figure 1). The average annual exports-GDP ratio during last two decades (FY2001-FY2020) was 14.1 percent, while average annual remittance-to-GDP ratio was 6.9 percent. However, net FDI inflows remained low and averaged 0.8 percent of GDP over the past two decades. With the onset of COVID-19 pandemic, growth in FY20 fell to 3.5 percent, a historically low level. In FY21, exports and imports recovered, reaching almost pre-pandemic levels, while remittances surpassed expectations. Nevertheless, the impact of the pandemic is expected to spill over into the medium term, adding to the existing challenges in transition.[7]

Figure 1. Major External Accounts (In percent of GDP in US dollars, FY2000-FY2020)



Sources: Bangladesh Bank; Bangladesh Bureau of Statistics; and IMF Staff calculations.

[5] In Bangladesh Fiscal year begins in July and ends in June.

[6] Data source: Bangladesh Bureau of Statistics (BBS).

[7] See 2021 *Bangladesh: Selected Issues* paper "The Medium-Term Effect of COVID-19 in Bangladesh" for a detailed discussion on the pandemic's impact.

C. Challenges Ahead

3. Looking ahead Bangladesh faces several challenges to go back to the high growth trajectory. Besides the uncertainties linked to the COVID-19 duration and impact, access to concessional loans, reflected in low external debt ratio, will gradually shrink in tandem with Bangladesh's growing GNI per capita. The anticipated graduation of Bangladesh from UN's LDC status to developing country by 2026 will eventually erode the export-related preferential treatments.[8] After LDC graduation, the effective tariff for Bangladesh may increase by 7.9 percent (WTO, 2020). The study also shows as Bangladesh exports most of its goods to preference-granting markets, such as, the EU, there is a limited scope for these exports to move to other markets. This points to the urgency of diversifying exports to compensate for the plausible losses.[9] Bangladesh will lose the specialized and differential treatment regarding WTO and will have to comply with Agreement of Subsidies and Countervailing Measures (SCM), Trade related Intellectual Property Rights (TRIPS) etc.[10] Currently there are several policies in Bangladesh such as fiscal incentives and tax rebates for the export-oriented industries, which constitute export subsidies under the Subsidies and Countervailing Measures (SCM) Agreement of the WTO. Being an LDC, Bangladesh is currently exempted from the prohibition of these subsidies. Reform of these policies will be required to sustain a smooth transition towards and after LDC graduation. On financing, impact will be limited as reduction in share of concessional lending, including IDA and PRGT, depends on increases in per capita income among other factors, and is not directly linked to LDC graduation (GED, 2021).[11] Remittance receipts, where Bangladesh has been outperforming many other LMICs, is likely to decline as with other countries in transition to UMIC and HIC (see figure 5). Bangladesh should address the specific challenges listed below to support its transition towards higher income status.

[8] Bangladesh met the LDC graduation thresholds for per capita GNI, human assets index (HAI) and economic and environmental vulnerability index (EVI) in 2018 for the first time in United Nation's Committee for Development Policy (CDP)'s 2018 Triennial Review. Bangladesh has met these three criteria in 2021 triennial review as well. Bangladesh is scheduled to graduate from LDC category in 2026 (UNDESA, 2022)).

[9] The reduction of exports from Bangladesh to preference-granting countries is estimated to be US$ 6.19 billion. The increase in exports to other regions is projected to be around US$0.83 billion. While these estimates do not account for the possibility of exporting countries to reallocate resources to other sectors and thus to start exporting more in other sectors, but (WTO, 2020).

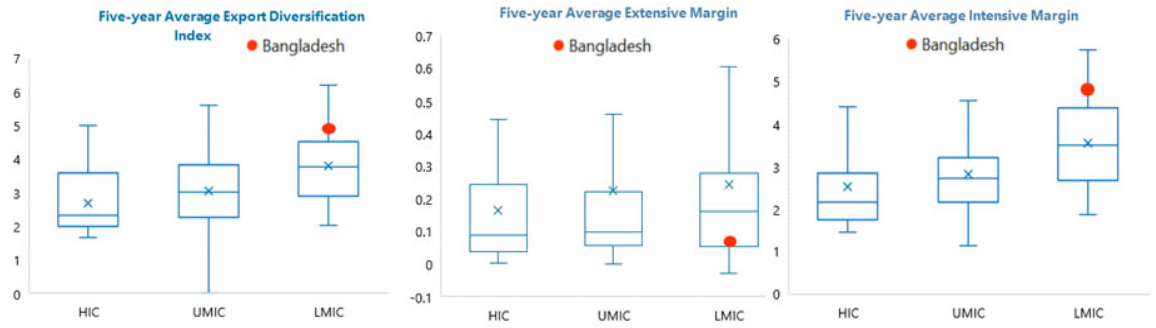
[10] Bangladesh has the highest 71 percent share of its exports that uses LDC specific preferences (WTO, 2020). It also enjoys the most flexible preferential rules of origin. TRIPS flexibilities helped Bangladesh promote its pharmaceutical industries, meeting about 98 percent of domestic demand and exporting to more than 100 countries (UNDESA, 2020). The US has discontinued the Generalized System of Preference (GSP) benefit for Bangladesh since June 2013 on account of the worker rights and worker safety issues (Office of the United States Trade Representative).

[11] External public and publicly guaranteed (PPG) was around 17.5 percent of GDP. External PPG debt is predominantly owed to multilateral and bilateral creditors, 53.2 and 30.3 percent of outstanding external PPG debt respectively, with some guaranteed SOE debt. (Ministry of Finance, Bangladesh, and IMF Staff calculations). From World Bank, Bangladesh now borrows on IDA blend terms, as it has GNI per capita above the IDA operational cutoff (USD 1205 in the fiscal year 2022) but has no access to IBRD loans (World Bank, 2022c). Currently Bangladesh is a Poverty Reduction and Growth Trust (PRGT) eligible country. PRGT loan provides concessional support. Bangladesh will graduate from the PRGT-eligibility list if its GNI per capita is at least twice the IDA threshold GNI per capita, and/or if it owns the market access criterion, and does not face serious short-term vulnerabilities as defined in the PRGT eligibility graduation criteria (IMF, 2020).

Narrow Export Basket

4. Bangladesh's export basket is one of the least diversified among the LMICs, with more than 80 percent comprising of RMG. For Bangladesh, the five-year average (2010–2014) Theil export diversification index, higher value of which implies lower diversification, was 4.9, worse than 3.8- the median five-year average index for the LMICs (Figures 2). During 1991-2014, the counties which graduated to UMICs and HICs had the median five-year average export diversification indices of 3 and 2.3, respectively, in their transition periods.[12] The five-year average extensive margin index, which measures the number of different export products, for Bangladesh was 0.1, better than median 0.2 for the LMICs. However, the five-year average intensive margin index, which represents the diversification of export volumes across the active export sectors, was 4.8 for Bangladesh worse than median 3.5 for the LMICs. This suggests that although Bangladesh has many products in the export list, its exports are limited to a few products-such as RMGs.[13] Structurally, high level of domestic market protection, low FDI, and poor infrastructure impede export diversification beyond RMG.[14] Bangladesh government's 8th FYP (FY21–FY25) aims to diversify the production and exports to the non-RMG sector including, processed food, leather and footwear, light engineering, and pharmaceuticals. It also proposes to remove the trade policy bias against exports by reducing trade protection and by promoting a more flexible and competitive exchange rate. Authorities said that

Figure 2. Export Diversification 1/



Sources: Export Diversification Database, IMF and IMF Staff calculations.
1/ See Appendix for data notes.

they are taking steps to gradually phase out inconsistent cash incentives and subsidies and rationalizing tariffs to be consistent with the WTO framework in time with the graduation process in

[12] The transition periods in this note are defined as the 5-year periods which end at the graduation years to higher income levels-i.e., graduation from LMICs to UMICs, and UMICs to HICs.

[13] Both intensive and extensive margin of diversification are important from a policy perspective. A country which exports many products (high diversification along extensive margin), but 80 percent of the exports are concentrated in one product like in RMG in Bangladesh (low diversification along intensive margin), would still be subject to macro volatility stemming from shock in that one sector. Hence diversifying along the intensive margin would still be important to reduce overall volatility (Giri, 2019).

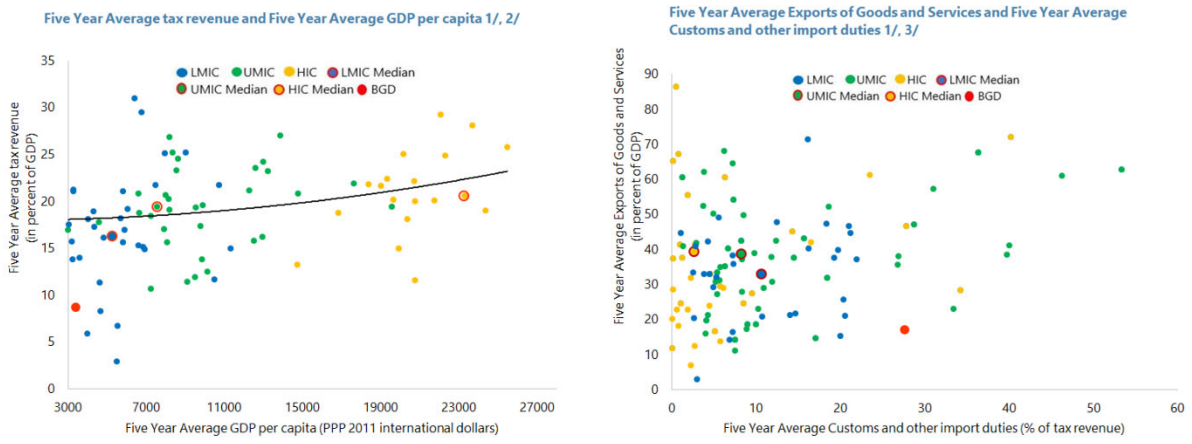
[14] IFC Bangladesh Country Strategy FY22–FY26.

2026. The government is also planning to formulate a 'National Tariff Policy' with a view to coordinate the tariff rationalization process, to maintain predictability of tariff rate determination, and to encourage export diversification.

Low Tax-to-GDP Ratio

5. Bangladesh has one of the lowest tax-to-GDP ratios among the LMICs. The five-year average tax-to-GDP ratio for Bangladesh during 2013-2017 was 8.6 percent while for the LMICs, which had graduated to UMICs after 1990, the median five-year average tax-to-GDP ratio during the transition periods was 19.4 percent (Table 1, Figure 3). Low revenue mobilization hinders Bangladesh's ability to spend more for physical infrastructure and human capital. In turn, this hinders the investment climate and factor productivity, limiting FDI inflows and exports. So far authorities have committed to the automation of revenue administration, and tax expenditure rationalization to boost tax revenues. More could be done including amending the tax and customs codes to rationalize tax expenditures, reviewing and simplifying the VAT structure to improve compliance and enhance the ability of NBR to efficiently administer it, as well as developing and adopting a medium-term revenue strategy.

Figure 3. Tax Revenue and Exports of Goods and Services (In percent of GDP)



Sources: Financial Flow Analytics and WEO Database, IMF; World Development Indicators, World Bank; and IMF Staff estimates.
1/, 2/, 3/ See Appendix for data notes.

High Customs and Other Import Duties

6. High customs and other import duties incentivize domestic producers to practice import substitution, providing an effectively high mark-up price in the domestic market. At 27.6 percent, Bangladesh has much higher customs and other import duties-to-tax ratio on average (2013–2017) than countries in transition to UMICs and HICs status (Figure 3). The low domestic tax revenue mobilization in Bangladesh also incentivizes keeping customs and import duties-to-tax ratio high. High customs and import duties in Bangladesh need to be rationalized.

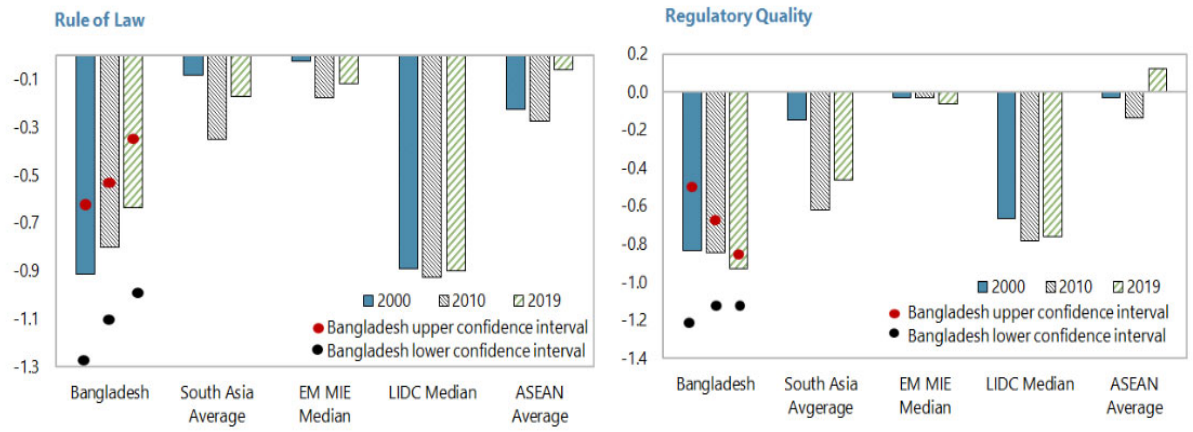
Low FDI Inflows

7. Bangladesh lags significantly behind the other LMICs in terms of FDI inflows (Table 1). The LMICs and UMICs, which graduated to UMICs and HICs after 1990, had on average higher gross FDI-to-GDP ratio in the transition periods -the median five-year average FDI-to-GDP ratios were, respectively, 4.2 percent and 7 percent. During 2013-2017, the average FDI-to-GDP ratio of Bangladesh was only 1.2 percent, against the median ratio of 2.5 percent for the LMICs. The authorities noted that the one-stop service platform, investments in supporting infrastructure, and continued efforts to improve skills will create a conducive investment climate and boost competitiveness. 100 economic zones by 2030 have been planned. They are also stepping up investments in several megaprojects, high tech parks, and SEZs, as well as modernizing agriculture and encouraging agro-processing to diversify exports.

Subdued Investment Climate

8. Improved investment climate may help Bangladesh increase FDI inflows. IMF (2018b) shows improvement in quality of legal system and minority investor protection significantly affects FDI inflows in GCC countries. In Bangladesh, structural reforms should focus on improving governance, including rule of law and the regulatory quality (Figure 4). Bangladesh Investment Development Authority (BIDA)'s One Stop Shop (OSS) is a good initiative for the investor services, which attempts to bring the different regulatory requirements of business (registration, licenses, permissions, etc.) in one place to minimize the cost and time burden for businesses and individuals. Authorities are also reaching out to investors to increase the awareness about the ongoing efforts to improve the business climate.

Figure 4. Rule of Law and Regulatory Quality (Index, -2,5 (weak) to 2,5 (strong))



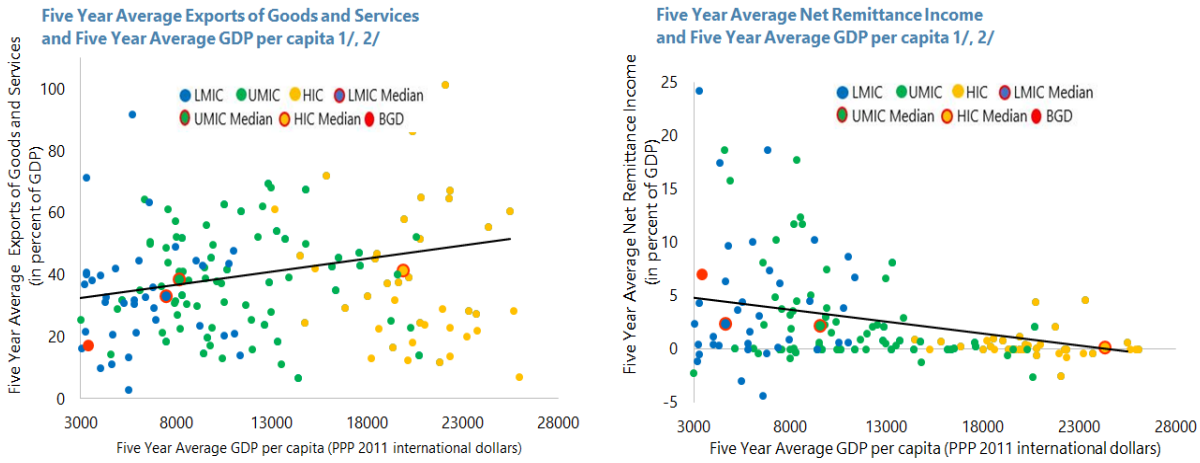
Source: Worldwide Governance Indicators

D. Bangladesh's Gap in Selected External Growth Drivers

Gap in Exports of Goods and Services-to-GDP Ratio

9. The five-year average exports of goods and services-to-GDP ratio for Bangladesh during 2013-2017 was 17.1 percent, almost a half of the median LMIC (33.0 percent).[15] The median five-year average exports of goods and services-to-GDP ratio of the LMICs and UMICs, in the transition to UMICs and HICs, respectively, after 1990, were 38.5 and 41.3 percent (Figure 5). Authorities are considering, bilateral free trade and preferential trade agreements and taking measures to remove tariff and non-tariff barriers. Adoption of digital solution, automation, and amending tax and custom code to rationalize tax expenditures will help to facilitate revenue mobilization while enabling reduction of high customs duties. These measures along with improving trade related infrastructure ensuring financing and targeted skill building to reduce labor-skill mismatches can help facilitate export growth and diversification. Empirical evidence suggests that exports of goods and services increase with increase in FDI inflows (Figure 7). More reform efforts to attract FDI would be beneficial in this regard.

Figure 5. Exports of Goods and Services and Net Remittance Income (In percent of GDP)



Sources: Financial Flow Analytics and WEO Database, IMF; World Development Indicators, World Bank and IMF Staff calculations.
1/, 2/ See Appendix for data notes.

Ahead in Remittances-to-GDP Ratio

10. Bangladesh is currently ahead of many countries in earning workers' remittances, but the country could gain even more with improvement in quality of migrant workers.[16] The five-year average (2013-2017) net workers' remittance income-to-GDP ratio of Bangladesh was

[15] The five-year average imports of goods and services-to-GDP ratio of Bangladesh during 2013–2017 was 22.9 percent, almost a half of the median 45 percent for the LMICs. After 1990, in the transition to UMICs and HICs, the LMICs and UMICs had, respectively, the median five-year average imports-GDP ratio of 50 and 47.3 percent.

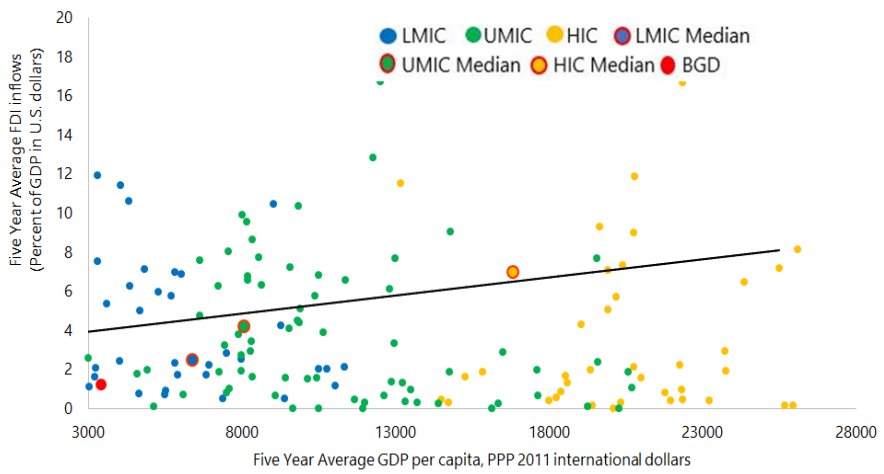
[16] In 2018, the professional and skilled migrants from Bangladesh were, respectively, 0.4 and 43.2 percent of total migrants (Bureau of Manpower, Employment and Training, Bangladesh).

6.9 percent. However, the median five-year average ratios of LMICs and UMICs in their transition phase to UMICs and HICs, were respectively, 2.3 and 0.1 percent demonstrating the structural decline and limited reliance on remittances as countries transition to higher income levels (Figure 5).

Gap in FDI Inflows-to-GDP Ratio

11. The medians of five-year average gross FDI-to-GDP ratios in the transition periods show the FDI-to-GDP ratio increases in sync with countries' graduation to higher income status (Figure 6). This suggests Bangladesh needs to make significant efforts to close the FDI gap in transition to higher income status. In this regard, the steps are being taken to improve the business climate by creating one-stop service platform, by stepping up investments in several megaprojects, and by building a large number of special economic zones and high-tech parks to improve backward linkages. However, increasing gross FDI-to-GDP ratio to 3 percent by FY25, as planned in the 8th FYP, will require continued liberalization of FX regulations as conditions allow, a review of the regulatory framework to be more supportive of trade and outward FDI, and further legal reforms, such as land registrations and contract enforcements. In addition, authorities need to take steps to strengthen governance, supervision and regulation in the financial sector to stem the flow of non-performing loans, particularly in the state-owned commercial banks. Efforts to reform the national saving certificate system should continue to help deepen capital market. Automation to increase secondary trading of government securities as well as ongoing efforts and plans to deepen the sukuk, municipal, and environment, social and governance (ESG) bond markets are also welcome.

Figure 6. Gross FDI Inflows (In percent of GDP) 1/, 2/



Sources: Financial Flow Analytics and WEO Database, IMF; World Development Indicators, World Bank and IMF Staff calculations.
1/, 2/ See Appendix for Data notes.

E. Empirical Diagnostics

12. The empirical diagnostics relied on panel fixed effect estimation to identify key variables that influence exports of goods and services -to-GDP ratio and FDI-to-GDP ratio in LMICs. While this approach helps to identify average sensitivity of a variable across a group of countries, identifying country-specific factors and heterogeneity across co-efficient remains a limitation to this approach and subject of further research.

How Can Bangladesh Close the Exports Gap?

13. There are several domestic pull and external push factors, which affect ratio of exports of goods and services-to-GDP. To see how these factors affect exports of goods and services-to-GDP, results from panel fixed-effect estimations are reported for LMICs, and a group of countries which include LMICs, UMICs, and HICs (Table 2).[17] The regression specifications are based on the existing literature on the determinants of exports (e.g., IMF (2018b). Some specifications considered the inclusion of inflation and government consumption relative to GDP, respectively, to represent monetary and fiscal policy stances following Dabla-Norris et al., 2010, which controlled for these variables to identify the impact of other variables on exports of goods

Table 2. Panel Fixed Effect Model: Exports of Goods and Services (Percent of GDP), Sample Period: 1992–2017

	(1) LMIC	(2) All	(3) LMIC	(4) All	(5) LMIC	(6) All	(7) LMIC	(8) All	(9) LMIC	(10) All
World real GDP growth	0.787***	0.841***	0.782***	0.949***	0.669***	0.821***	0.740***	0.934***	0.694***	0.967***
	(0.157)	(0.123)	(0.184)	(0.173)	(0.205)	(0.199)	(0.185)	(0.198)	(0.179)	(0.221)
Real GDP per capita (log)	1.562	9.108***	0.093	7.778***	-2.934	7.537**	6.340	14.780**	3.668	15.737**
	(2.280)	(1.821)	(2.538)	(2.113)	(3.262)	(2.899)	(5.969)	(5.748)	(6.110)	(5.979)
Real GDP growth	0.145*	0.043	0.224*	0.113*	0.319**	0.015	0.142	-0.022	0.155	-0.004
	(0.087)	(0.038)	(0.116)	(0.067)	(0.137)	(0.088)	(0.104)	(0.095)	(0.103)	(0.103)
REER index (log)	-12.435***	-13.238***	-13.172***	-7.647*	-14.998***	-9.468*	-14.751***	-13.310**	-16.214***	-14.056**
	(3.110)	(4.073)	(3.659)	(4.037)	(2.946)	(4.915)	(3.102)	(5.203)	(3.561)	(6.106)
Customs and other import duties (% of tax revenue)			-0.099	-0.105	-0.027	-0.156**	-0.081	-0.085	-0.137	-0.068
			(0.063)	(0.082)	(0.074)	(0.068)	(0.084)	(0.103)	(0.090)	(0.112)
Tax revenue/GDP					0.688**	0.189	0.557*	0.145	0.494*	0.043
					(0.266)	(0.243)	(0.285)	(0.296)	(0.280)	(0.322)
Government consumption/GDP					0.229	-0.438***	0.115	-0.456**	0.088	-0.490**
					(0.198)	(0.159)	(0.229)	(0.177)	(0.260)	(0.194)
Corporate income tax rate							0.413**	-0.122	0.395**	-0.119
							(0.170)	(0.106)	(0.176)	(0.111)
CPI Inflation									-0.047	-0.039
									(0.042)	(0.069)
Constant	74.747***	14.262	92.339***	-1.337	110.605***	14.859	20.824	-33.586	54.114	-36.557
	(23.973)	(25.368)	(23.010)	(28.075)	(24.398)	(33.717)	(48.877)	(51.285)	(51.279)	(56.205)
Country-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1248	3237	713	1864	514	1397	434	1192	414	1119
Adjusted R-squared	0.082	0.092	0.121	0.098	0.223	0.133	0.255	0.190	0.261	0.203
Number of countries	104	156	75	126	61	112	50	94	48	90

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All explanatory variables except world real GDP growth are one year lagged to mitigate endogeneity concern. The specifications include several groups of countries classified by World Bank: LMIC (lower-middle income countries), UMIC (upper-middle income countries), HIC (high-income countries). All countries include LMIC, UMIC, and HIC.

[17] The fixed effect panel regression models control the country specific characteristics such as geographic location which don't change over time. The country fixed effects are also likely to absorb the effects of country-specific slow-moving factors, such as some doing business and institutional quality indices. For different country groups, World Bank's classifications are considered - such as, China is considered as a LMIC for the period 1997–2009, and as a UMIC since 2010 onward. For the estimations, the sample period is 1992-2017, and the number of countries varies from 48 to 156.

and services in percent of GDP. In addition, tax revenue-to-GDP ratio to proxy government's resource mobilization and investment capacity was considered, while controlling for government consumption-to-GDP ratio. All domestic explanatory variables are lagged one year to mitigate potential endogeneity problem. The standard errors are clustered at country level.

- **REER (in logs**). Appreciation of REER adversely impacts exports of goods and services-to-GDP ratio in LMICs.[18] A one percent increase of REER (appreciation) could cause an estimated average decline of exports of goods and services by about 0.12–0.16 of a percent of GDP, which is consistent with the empirical findings estimated for the GCC countries in IMF (2018b). REER index of Bangladesh appreciated by 51 percent during 2012 to 2020[19]. During this period, NEER index appreciated by 11 percent. The substantial appreciations of NEER and REER suggests that there had been a significant loss of trade competitiveness for Bangladesh since 2012. It warrants a prudent exchange rate policy consideration in Bangladesh, allowing further flexibility of exchange rate, along with measures to enhance total factor productivity to gain price competitiveness.

- **Trading Partners' Growth**.The impact of real GDP growth of the rest of the world-which is proxied by world's real GDP growth, is significant for the LMICs. A one percent decline in real GDP growth of the rest of the world could cause a decline of exports of goods and services by about 0.7 to 0.8 of a percent of GDP in the LMICs. Currently, the main export markets for Bangladesh are Europe and USA, which comprise about 75 percent of total exports[20]. Such high dependence on certain markets entail high risk of exports slowdown in the event of any significant slowdown in these economies, as well as a major shift in their trade policies.

- **Real GDP Per Capita (in logs).** Real GDP per capita-is used as a proxy of country's level of development. Empirical estimations show that a 1 percent increase of per capita GDP could cause an estimated average increase of exports of goods and services by about 0.08-0.16 of a percent of GDP.

- **Revenue Mobilization.** Higher revenue mobilization could help Bangladesh spend more on the needed physical infrastructure and human capital to enhance investment climate and total factor productivity which in turn could boost exports of goods and services-to-GDP ratio. A one

[18] REER index is a nominal effective exchange rate (NEER) index adjusted for relative movements in national price or cost indicators of the home country and selected other countries (or currency unions). NEER index is a measure of the value of a home currency in terms of a weighted average of several foreign currencies.

[19] Source: Information Notice System, IMF.

[20] Source: Export Promotion Bureau (EPB), Bangladesh.

percent increase of tax-to-GDP ratio could cause an estimated average increase of exports of goods and services by about 0.5-0.7 of a percent of GDP in the LMICs.[21]

B. How can Bangladesh Close the FDI Gap?

14. Table 3 shows the results of several fixed-effect panel regression specifications to estimate the impact of different domestic pull and external push factors on FDI inflows-to-GDP ratio of LMICs and a group of countries which include LMICs, UMICs and HICs.[22] The empirical estimations follow the methodologies specified in IMF (2018a). As the specifications in table 2, some specifications are considered following Dabla-Norris et al., 2010, such as the inclusion of government consumption relative to GDP and inflation, respectively to represent fiscal and monetary policy stances. In addition, tax revenue-to-GDP ratio is used to proxy government's resource mobilization and investment capacity, while controlling for government consumption-to-GDP ratio. All domestic explanatory variables are lagged one year to mitigate potential endogeneity problem. The standard errors are clustered at country level.

- **Global Commodity Price.** The empirical estimation results in Table 3 show the global push factor, such as an increase in global commodity price index, has estimated average positive impact on FDI inflows-to-GDP in LMICs. This finding is consistent with the estimation results of IMF (2018 a), which estimated the effects of different factors on FDI inflows-to-GDP ratio in Sub-Saharan African countries. IMF (2018 a) also estimated a significant negative impact of tightening in global financing conditions-proxied by a rise in US government bond yield rate on FDI inflows-to-GDP ratio in Sub-Saharan African countries. However, no such evidence was observed for FDI inflows-to-GDP ratio of LMICs.

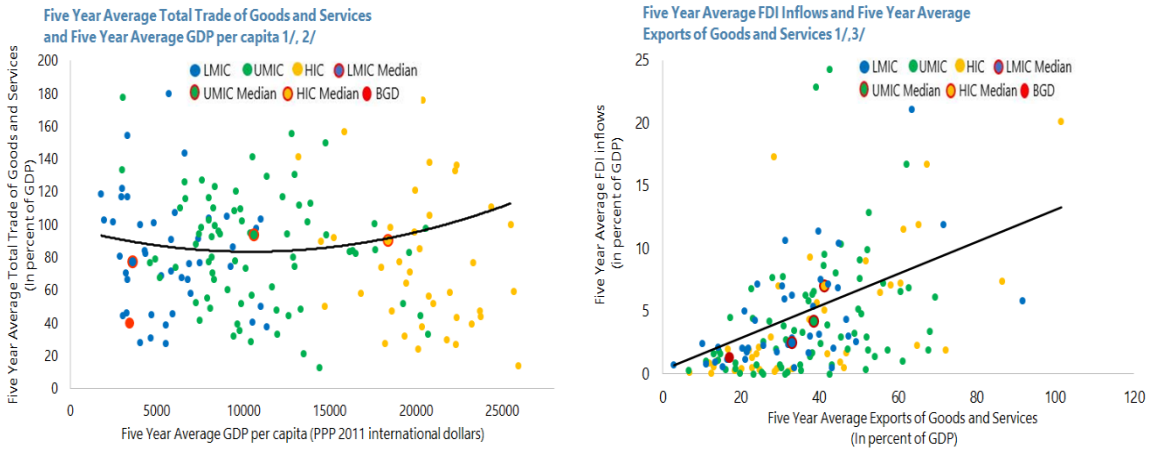
- **Trade Openness.** Bangladesh could attract more FDI inflows, by enhancing its trade-to-GDP ratio. Trade openness measured by the total sum of exports and imports in share of GDP has an estimated positive effect on FDI inflows-to-GDP ratio. This is consistent with the findings in IMF (2018 b). The five-year average total trade-to-GDP ratio of Bangladesh during 2013-2017 accounted for 39.9 percent, compared to the median five-year average ratio of 76.8 percent for

[21] Macroeconomic instability, proxied by high government consumption-to-GDP ratio – and mimicking an expansionary fiscal stance, has an estimated negative impact on exports of goods and services-to-GDP ratio for the group of countries which include LMICs, UMICs and HICs. Once the consumption-GDP ratio is controlled in the regression specifications, higher tax-to-GDP ratio reflects government's ability to spend more for physical infrastructure and human capital. In case of LMICs there is an estimated average positive impact of high corporate tax rate on exports of goods and services-to-GDP ratio, which could be explained in many of LMICs such as Bangladesh where major export industries are exempted from high corporate tax rate.

[22] For different country groups, World Bank's classifications are considered-such as China is considered as a LMIC for the period 1997-2009, and as a UMIC since 2010 onward. For the estimations, the sample period is 1992-2017, and the number of countries varies from 66 to 112. The value of adjusted R-squared is low and the results should be interpreted within this caveat. The results from the literature suggest the goodness of fit particularly for low-income countries (LICs) is weak (Dabla-Norris 2010, IMF (2018 a)).

the LMICs (Table 1). It is observed that in transition to UMICs and HICs, there had been a positive correlation between FDI inflows-to-GDP ratio and exports-to-GDP ratio (Figure 7).[23]

Figure 7. Total Trade of Goods and Services, and FDI Inflows (In percent of GDP)



Sources: Financial Flow Analytics and WEO Database, IMF; World Development Indicators, World Bank; and IMF Staff calculations.
1/ ,2/, 3/ See Appendix for data notes.

- **Capital account Openness.** It is estimated that greater degree of capital account openness attracts more FDI inflows.[24] This is consistent with the empirical findings in IMF (2018 b). In 2017, the Chinn Ito index for the LMICs ranged from -1.9 to 2.3 (higher value represents more openness), while Bangladesh had a score of -1.2. The new outward investment policy of Bangladesh is expected to increase the capital account openness.

- **Macroeconomic Stability and Revenue Mobilization.** Macroeconomic instability reflected by high government consumption-to-GDP ratio has an estimated negative impact on FDI inflows-to-GDP ratio, which is consistent with the findings in Dabla-Norris et al., 2010. Once the government consumption-to-GDP ratio is controlled for in the empirical estimations, higher tax-to-GDP ratio seem to help with attracting FDI inflows due to the spillover impacts from tax financed capital spending.

[23] For the LMICs, the coefficient of correlation between the five-year average (2013-2017) export-to-GDP ratio and FDI-to-GDP ratio is 0.5. The UMICs which had graduated to HICs after 1990, the coefficient of correlation between the five-year average export-to-GDP ratio and FDI-to-GDP ratio during the graduation period is 0.6. Both the coefficients are significant at 1 percent level of significance.

[24] Capital account openness (Chinn Ito index) is a measure of (de jure) financial account openness taken from Chinn and Ito (2008). This index is based on the binary dummy variables that codify the tabulation of restrictions on cross-border financial transactions reported in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER).

Table 3. Panel Fixed Effect Model: FDI Inflows (Percent of GDP), Sample period: 1992–2017

	(1) LMIC	(2) All	(3) LMIC	(4) All
US gov. bond yield	0.014	1.134	-0.025	1.451
	(0.368)	(0.968)	(0.379)	(1.085)
Commodity price index (log)	2.160***	6.593*	1.877***	6.821*
	(0.631)	(3.540)	(0.645)	(3.661)
S&P 500 index return volatility	0.024	-0.041	0.023	-0.036
	(0.029)	(0.062)	(0.030)	(0.066)
Trade openness	0.028*	-0.046	0.033*	-0.028
	(0.017)	(0.075)	(0.018)	(0.086)
Real GDP per capita (log)	-4.464	-4.831	-4.914	-3.505
	(4.334)	(5.324)	(4.608)	(5.298)
Real GDP growth	-0.113	-0.007	-0.130	-0.022
	(0.097)	(0.131)	(0.104)	(0.131)
REER index (log)	-1.475	-3.900	-1.686	-4.677
	(1.690)	(3.769)	(1.769)	(4.841)
Capital account openness	0.810*	1.484	0.790*	1.235
	(0.419)	(1.247)	(0.454)	(1.384)
External debt/GDP	-0.006	-0.029	-0.008	-0.045
	(0.008)	(0.044)	(0.008)	(0.043)
Government consumption/GDP	-0.107	-0.032	-0.090	-0.062
	(0.107)	(0.054)	(0.119)	(0.120)
Tax revenue/GDP	0.113	0.249*	0.122	0.225
	(0.073)	(0.149)	(0.073)	(0.167)
Corporate income tax rate	0.014	-0.130	0.010	-0.141
	(0.046)	(0.123)	(0.047)	(0.150)
CPI Inflation			-0.009	-0.009
			(0.011)	(0.015)
Constant	37.092	40.406	42.854	30.156
	(36.905)	(40.919)	(41.125)	(43.199)
Country-fixed effects	Yes	Yes	Yes	Yes
Observations	712	1678	675	1567
Adjusted R-squared	0.091	0.010	0.093	0.016
Number of countries	68	112	66	108

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All explanatory variables except US gov. bond yield, commodity price index (log), and S&P 500 index return volatility are one year lagged to mitigate endogeneity concern. The specifications include several groups of countries classified by World Bank: LMIC (lower-middle income countries), UMIC (upper-middle income countries), HIC (high-income countries). All countries include LMIC, UMIC, and HIC.

Appendix I. Methodology Notes

Methodology for the Scatterplot and Boxplot Charts:

1. In comparing Bangladesh's distance or gap with other LMICs, UMICs and HICs, the five-year average of the selected external or domestic account indicators (in percent of GDP) is considered. The scatterplots-in case of LMICs, including Bangladesh, show the five-year average of the selected external or domestic accounts-to-GDP ratio, and the five-year average per capita GDP (PPP 2011 international dollars) for the period 2013-2017, while for the UMICs and HICs, the five-year average periods are the transition periods. The transition periods are defined as the 5-year periods which end at the graduation years to higher income levels-i.e., graduation from LMICs to UMICs, and UMICs to HICs. The LMICs, which graduated to UMICs during 1987-2017 are considered as UMICs. The UMICs, which graduated to HICs during 1976-2017 are considered as HICs. Before starting to classify high per capita income countries as HICs in 1987, World Bank would classify them earlier as industrialized countries beginning in 1976. In this note, the first identification year of a country in industrialized category is considered as the graduation year to HIC status. The scatter plots include data for the period 1976-2017, while the fitted regression lines and the medians of the five-year average ratios in the scatter plots consider data for the period: 1991-2017 only-the period of growing global financial integration through financial liberalization and technological advancement.

Table A1. World Bank's classification in 2017 1/

Low income countries (LICs)	Afghanistan, Benin, Burkina Faso, Burundi, Central African Republic, Chad, Comoros, Democratic Republic of the Congo, Eritrea, Ethiopia, The Gambia, Guinea, Guinea-Bissau, Haiti, Liberia, Madagascar, Malawi, Mali, Mozambique, Nepal, Niger, Rwanda, Senegal, Sierra Leone, South Sudan, Syria, Tajikistan, Tanzania, Togo, Uganda, Yemen and Zimbabwe.
Lower middle income countries (LMICs)	Angola, Bangladesh, Bhutan, Bolivia, Cabo Verde, Cambodia, Cameroon, Republic of Congo, Cote d'Ivoire, Djibouti, Egypt, El Salvador, Georgia, Ghana, Honduras, India, Indonesia, Kenya, Kiribati, Kosovo, Kyrgyz Republic, Lao P.D.R., Lesotho, Mauritania, Micronesia, Moldova, Mongolia, Morocco, Myanmar, Nicaragua, Nigeria, Pakistan, Papua New Guinea, Philippines, Sao Tome and Principe, Solomon Islands, Sri Lanka, Sudan, Swaziland, Timor-Leste, Tunisia, Ukraine, Vanuatu, Vietnam and Zambia.
Upper middle income countries (UMICs)	Albania, Algeria, Armenia, Azerbaijan, Belarus, Belize, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, China, Colombia, Costa Rica, Dominica, Dominican Republic, Ecuador, Equatorial Guinea, Fiji, Gabon, Grenada, Guatemala, Guyana, Iran, Iraq, Jamaica, Jordan, Kazakhstan, Lebanon, Libya, FYR Macedonia, Malaysia, Maldives, Marshall Islands, Mauritius, Mexico, Rep. of Montenegro, Namibia, Paraguay, Peru, Romania, Russia, Samoa, Serbia, South Africa, St. Lucia, St. Vincent and the Grenadines, Suriname, Thailand, Tonga, Turkey, Turkmenistan, Tuvalu and Venezuela.
High income countries (HICs)	Antigua and Barbuda, Argentina, Australia, Austria, The Bahamas, Bahrain, Barbados, Belgium, Brunei Darussalam, Canada, Chile, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong SAR, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Kuwait, Latvia, Lithuania, Luxembourg, Malta, Netherlands, New Zealand, Norway, Oman, Palau, Panama, Poland, Portugal, Qatar, Saudi Arabia, Seychelles, Singapore, Slovak Republic, Slovenia, Spain, St. Kitts and Nevis, Sweden, Switzerland, Taiwan Province of China, Trinidad and Tobago, United Kingdom, United States and Uruguay.

Source: World Bank.
1/ The terms 'country' and 'economy', used in this paper, always do not mean territorial entity as a state- as recognized by the international law and practice. For some territorial entities, statistical data are maintained on a separate and independent basis though they are no states.

Table A2. First classification year of a country in new income-group status by World Bank 1/

Upper-middle income countries: First classification year (in parentheses)	Albania (2009), Algeria (1981), Angola (2011), Antigua and Barbuda (1987), Argentina (1981), Armenia (2017), Azerbaijan (2009), Barbados (1987), Belarus (1997), Belize (2002), Bosnia and Herzegovina (2008), Botswana (1991), Brazil (1981), Bulgaria (2006), Chile (1981), China (2010), Colombia (2008), Costa Rica (2000), Croatia (1997), Cyprus (1987), Czech Republic (1997), Dominica (1999), Dominican Republic (2008), Ecuador (2010), Estonia (1997), Fiji (2007), Gabon (1986), Georgia (2015), Greece (1981), Grenada (1997), Guatemala (2017), Guyana (2015), Hungary (1986), Iran (1981), Israel (1981), Jamaica (2007), Jordan (1982), Kazakhstan (2006), Korea (1981), Latvia (1996), Lithuania (1999), FYR Macedonia (2008), Malaysia (1981), Malta (1987), Marshall Islands (2012), Mauritius (1992), Mexico (1983), Mongolia (2014), Rep. of Montenegro (2011), Namibia (2008), Panama (1981), Paraguay (2014), Peru (2008), Poland (1985), Portugal (1981), Romania (1985), Russia (1998), Samoa (2016), Serbia (2011), Seychelles (1987), Singapore (1981), Slovak Republic (1997), Slovenia (1996), South Africa (1981), St. Kitts and Nevis (1987), St. Lucia (1992), St. Vincent and the Grenadines (2003), Suriname (1987), Seychelles (1987),Thailand (2010), Tonga (2012), Trinidad and Tobago (1981), Tunisia (2010), Turkey (1997), Turkmenistan, Tuvalu (2011), Uruguay (1982), and Venezuela (1981).
High income countries: First classification year (in parentheses)	Antigua and Barbuda (2002), Argentina (2014), Barbados (1989), Chile (2012), Croatia (2008), Cyprus (1988), Czech Republic (2006), Estonia (2006), Greece (1996), Hungary (2007), Israel (1987), Korea (1995), Latvia (2009), Lithuania (2012), Malta (1989), Palau (2016), Panama (2017), Poland (2009), Portugal (1994), Russia (2012), Seychelles (2014), Singapore (1987), Slovak Republic (2007), Slovenia (1997), St. Kitts and Nevis (2011), Trinidad and Tobago (2006), and Uruguay (2012).
Industrialized countries: First classification year (in parentheses)	Australia (1976), Austria (1976), Canada (1976), Denmark (1979), Finland (1979), France (1979), Germany (1976), Ireland (1978), Italy (1976), Japan (1981), New Zealand (1976), Spain (1980), United Kingdom(1976) and United States (1976).

Source: World Bank

1/First classification years of industrialized countries have been taken from World Bank's various World Development Reports since 1978.

2. Notes for Table 1: 1/ The transition period is defined as the 5-year period which ends at the graduation year to higher income levels-i.e., graduation from LMICs to UMICs, and UMICs to HICs. 2/ These include the UMICs and HICs which graduated after 1990. See table A1 and A2 in the appendix¶1, for the list of countries. 3/ The Theil export diversification index, for which the higher value implies the lower diversification, is available up to 2014. For this index, the average for Bangladesh and LMICs, reflects the period 2010-2014.

3. Notes for Figure 2: 1/ Lower values indicate higher diversification. HIC: Box plot of 5-year averages of UMICs for the period ends at graduation year to HICs during 1991-2014. UMIC: Box plot of 5-year averages of LMICs for the period ends at graduation year to UMICs during 1991-2014. LMIC: Box plot of 5-year averages of LMICs for the period 2010-2014. Upper edge of box plots shows maximum value; lower edge shows minimum value; middle three edge from bottom respectively shows first quartile, median, and third quartile. The 'x' point indicates average value. Outliers are not shown in the box plots. Red dot stands for Bangladesh's position.

4. Notes for Figure 3: 1/ LMIC: scatterplots of 5-year averages in case of LMICs for the period 2013-2017. UMIC: 5-year averages in case of LMICs for the periods end at graduation year to UMICs during 1987-2017. HIC: 5-year averages in case of UMICs for the periods end at graduation year to HICs during 1976-2017. BGD: 5-year average in case of Bangladesh for the period 2013-2017. Details of the scatterplots and country lists are provided in the appendix ¶1. 2/ LMIC Median: Median of the Y-axis variable of LMICs for the period 2013-2017. UMIC Median: Median of the Y-axis variable of UMICs in transition periods during 1991-2017. HIC Median: Median of the Y-axis

variable of HICs in transition periods during 1991-2017. The fitted regression line in the scatter plot considers data for the period: 1991-2017. 3/ LMIC Median: Medians of both X and Y axis variables during 1991-2017. UMIC Median: Medians of both X and Y axis variables of UMICs in transition period during 1991-2017. HIC Median: Medians of both X and Y axis variables of HICs in transition period during 1991-2017.

5. Notes for Figure 5: 1/ LMIC: scatterplots of 5-year averages in case of LMICs for the period 2013-2017. UMIC: 5-year averages in case of LMICs for the periods end at graduation year to UMICs during 1987-2017. HIC: 5-year averages in case of UMICs for the periods end at graduation year to HICs during 1976-2017. BGD: 5-year average in case of Bangladesh for the period 2013-2017. Details of the scatterplots and country lists are provided in the appendix. 2/ LMIC Median: Median of the Y-axis variable of LMICs for the period 2013-2017. UMIC Median: Median of the Y-axis variable of UMICs in transition periods during 1991-2017. HIC Median: Median of the Y-axis variable of HICs in transition periods during 1991-2017. The fitted regression line in the scatter plot considers data for the period: 1991-2017.

6. Notes for Figure 6: LMIC: scatterplots of 5-year averages in case of LMICs for the period 2013-2017. UMIC: 5-year averages in case of LMICs for the periods end at graduation year to UMICs during 1987-2017. HIC: 5-year averages in case of UMICs for the periods end at graduation year to HICs during 1976-2017. BGD: 5-year average in case of Bangladesh for the period 2013-2017. 2/ LMIC Median: Median of the Y-axis variable of LMICs for the period 2013-2017. UMIC Median: Median of the Y-axis variable of UMICs in transition periods during 1991-2017. HIC Median: Median of the Y-axis variable of HICs in transition periods during 1991-2017. The fitted regression line in the scatter plot considers data for the period: 1991-2017. Details of the scatterplots and country lists are provided in the appendix ¶1.

7. Notes for Figure 7: 1/ LMIC: scatterplots of 5-year averages in case of LMICs for the period 2013-2017. UMIC: 5-year averages in case of LMICs for the periods end at graduation year to UMICs during 1987-2017. HIC: 5-year averages in case of UMICs for the periods end at graduation year to HICs during 1976-2017. BGD: 5-year average in case of Bangladesh for the period 2013-2017. Details of the scatterplots and country lists are provided in the appendix. 2/ LMIC Median: Median of the Y-axis variable of LMICs for the period 2013-2017. UMIC Median: Median of the Y-axis variable of UMICs in transition periods during 1991-2017. HIC Median: Median of the Y-axis variable of HICs in transition periods during 1991-2017. The fitted regression line in the scatter plot considers data for the period: 1991-2017. 3/ LMIC Median: Medians of both X and Y axis variables during 1991-2017. UMIC Median: Medians of both X and Y axis variables of UMICs in transition period during 1991-2017. HIC Median: Medians of both X and Y axis variables of HICs in transition period during 1991-2017. The fitted regression line in the scatter plot considers data for the period: 1991-2017.