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BIGD WORKING PAPER
NO. 58 ■ OCTOBER 2020

Socio-Economic Impact Assessment of COVID-19 and Policy Implications for Bangladesh

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MACROECONOMICS SERIES

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This paper has been prepared as part of a research project undertaken by the Brac Institute of Governance and Development (BIGD).

October 2020

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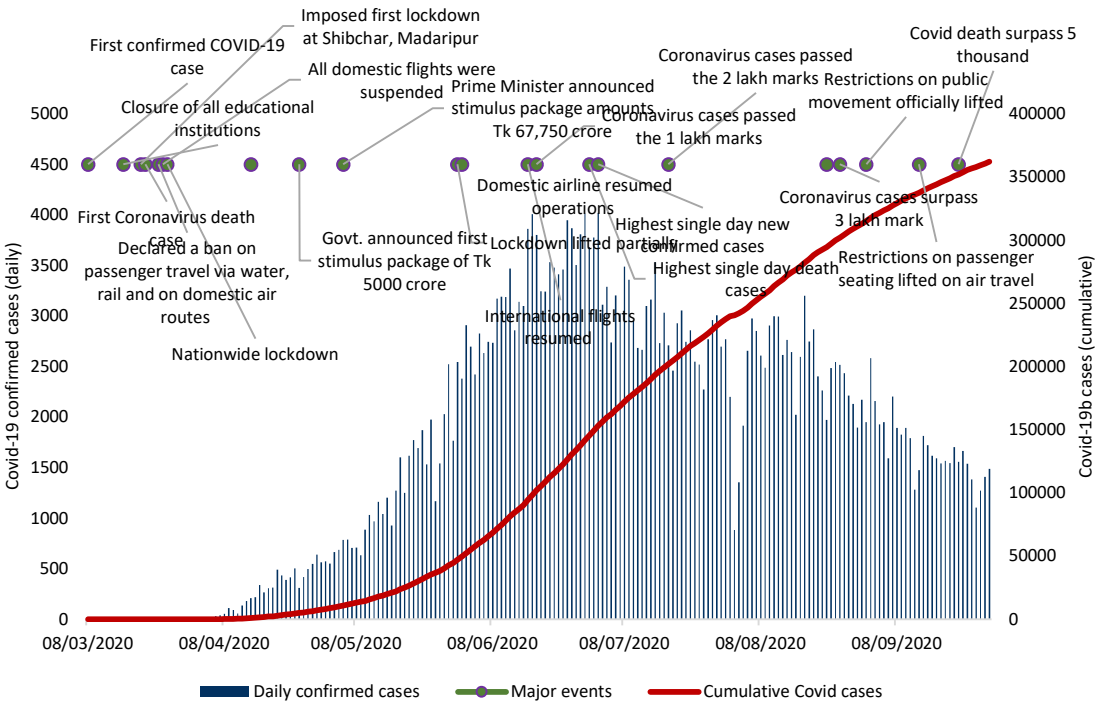
I. Introduction

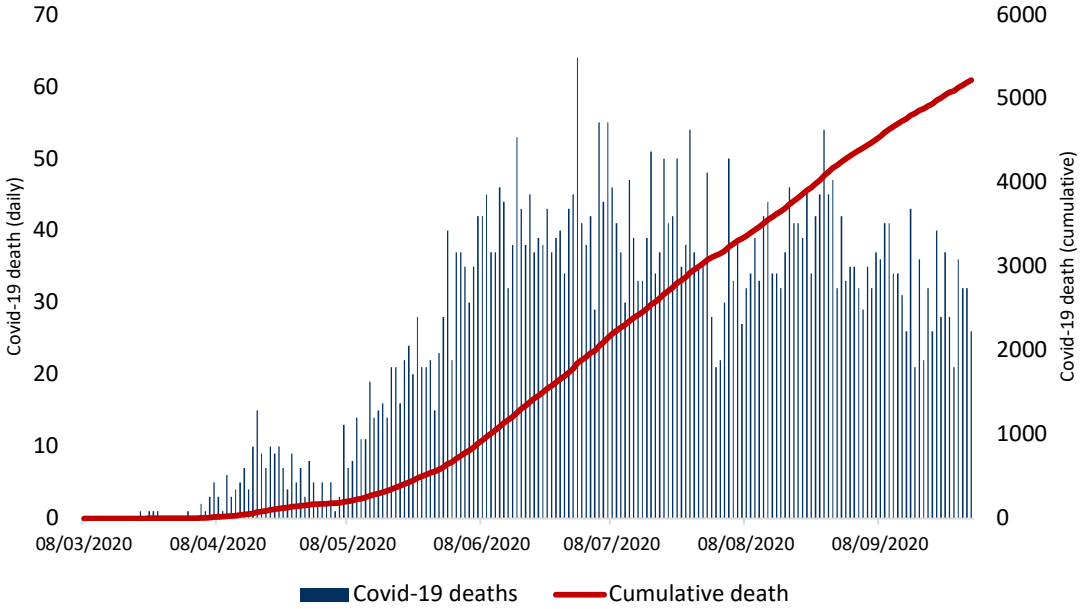
The Covid-19 pandemic is causing an unprecedented health and economic crisis for global economies, including Bangladesh. The economic and social disruption caused by the pandemic as reflected in a massive loss of human life worldwide, drastic decline in economic activities and employment, huge pressure on public health and other support services, social and physical distancing, etc. has been devastating. Since the first confirmed case of infection in March 2020, Bangladesh, like many other countries, had to consider some extraordinary measures including, amongst others, closure of all educational institutions, enforcement of economic shutdown measures and gradual reopening of economic activities, rolling out a stimulus package for business enterprises, etc. (Figure 1). By the end of September 2020, more than 3.6 million officially confirmed infection cases were reported (Figure 1) along with above 5,000 death due to Covid-19 (Figure 2). The prolonged disruptions in economic activities are being reflected through depressed domestic demand, interrupted supply response in the local economy and slowdown in global economic activities affecting global trade and international financial flows.

Figure 1: Covid-19 cases and major events in Bangladesh



Note: information on major events is collected from various sources.
Source: Government of Bangladesh and https://ourworldindata.org/

Figure 2: Covid-19 death in Bangladesh



Source: Government of Bangladesh and https://ourworldindata.org/

Quantifying the impact of the crisis for a country like Bangladesh is far from being straightforward as there are severe capacity constraints in gathering data in a way that will be nationally representative. Bangladesh does not provide quarterly GDP estimates and thus any short-term fluctuations in economic outputs are difficult to ascertain. Several multinational agencies e.g., the Asian Development Bank (ADB), International Monetary Fund (IMF), and World Bank undertake regular projection exercises mainly to indicate implications for growth for the world economy and individual economies. By their nature, in most cases, these projections utilise certain generalised economic structures and assumptions without considering detailed and specific features that could be more relevant for an individual economy. While there are attempts to inform the projection exercises by utilising the country-specific information based on the perception of key informants, growth predictions of international organisations often fall far short of Bangladesh's official estimates. After the outbreak of Covid-19, while the World Bank and IMF forecast Bangladesh's economic growth to be in the range 1.6 per cent – 3.2 per cent for 2019-20, the official estimate later would settle at a much higher level of 6.24 per cent. The primary responsibility of GDP calculations lies with the Bangladesh Bureau of Statistics (BBS) and it is difficult to evaluate its estimates in the absence of any other mechanism for generating timely and adequate information.

There have been various surveys carried out in the months following the Covid-19 outbreak mainly to understand the impact at the individual and/or household level. Although these exercises could capture incidences of severe job loss and/or income fall for many, no attempts were made to provide nationally representative estimates comparable to those form the BBS household survey, the latest of which is available for 2015. Enterprise-level information has been particularly scarce with no estimates being made available from any sources on the potential loss of output.

Yet another problem for Bangladesh has been to relate the immediate income and output shocks to economic prospects over a slightly longer-term horizon. In the absence of a quarterly GDP accounting system, this would imply assessing any short-term impact on economywide activities over a full fiscal year period (July–June), which is a sensitive matter as yearly output growth can be perceived as effectiveness of government policies and actions. Therefore, micro studies – albeit with their limitations of being not nationally representative – can show a drastic fall in income and employment, e.g. as a result of shutdown measures imposed to contain the spread of the virus, however, it will not be clear to what extent any lost output and employment could be recovered as the economy eventually bounces back.

However, the most striking feature of official assessments of Covid-19 has been an apparently incoherent growth and poverty relationship, which has shown poverty to rise by a staggering 10-percentage points despite a rather impressive GDP growth, as mentioned above. This is particularly perplexing given that a high GDP growth (of 8 per cent) is forecast by official sources for the ongoing fiscal year (2020-21) as well. With impressive growth rates for two consecutive years, such high rise in poverty is only possible if income distribution deteriorates sharply. In reality, the problem might be that the year-long economic activities are considered for growth assessment, while poverty estimates are based on the likely impact of lockdown measures.

This study is motivated by the fact that understanding the economywide impact of Covid-19 has been challenging in Bangladesh. The lack of data is a major constraint, but it is also important to analyse the issues through a data-consistent macroeconomic framework. As undertaking large-scale data gathering exercises can be quite time-consuming and is especially difficult due to social distancing requirements, ex-ante general equilibrium model based simulation exercises can be undertaken to derive theoretically plausible and consistent macroeconomic results, which are critical for deducing policy implications. One advantage of such model-based assessments is that it allows working with alternative scenarios with the likely implications under each scenario being also consistent. This study thus utilises the Global Trade Analysis Project (GTAP) model – a multi-region/multi-country computable general equilibrium comparative static framework – to explore the potential impacts of Covid-19 induced disruptions for Bangladesh under three different alternative – low-shock, medium-shock and high-shock scenarios. It outlines the transmission mechanisms through which the Bangladesh economy is being affected to assess the impact on major macroeconomic variables and sectoral outputs. These results are then incorporated into the social accounting matrix for Bangladesh to simulate the likely income and poverty effects for various types of households. This study also explores the likely impact of government support measures through the stimulus package in mitigating the adverse consequences.

The findings reported here should contribute to the informed policy discourse. The underlying research makes use of an adaptable, flexible, and executable modelling framework to generate ex ante analyses that among other aim to assess the impact of various policies. In the absence of a detailed and informed analysis, socio-economic consequences that are likely to unfold may not be duly appreciated while devising the policy instruments in dealing with adverse circumstances. For example, the stimulus package and fiscal measures under implementation have been considered on an ad hoc basis without analysing their likely effects, for instance, on economic activities and poverty outcomes. The simulations undertaken as part of this paper provide insights into these thereby

helping improve policy designs. The findings should also facilitate discussions among policymakers, researchers, and other stakeholders about the effectiveness of various policy instruments, scope of adopting new measures, and improving the modelling framework further for generating improved insights.

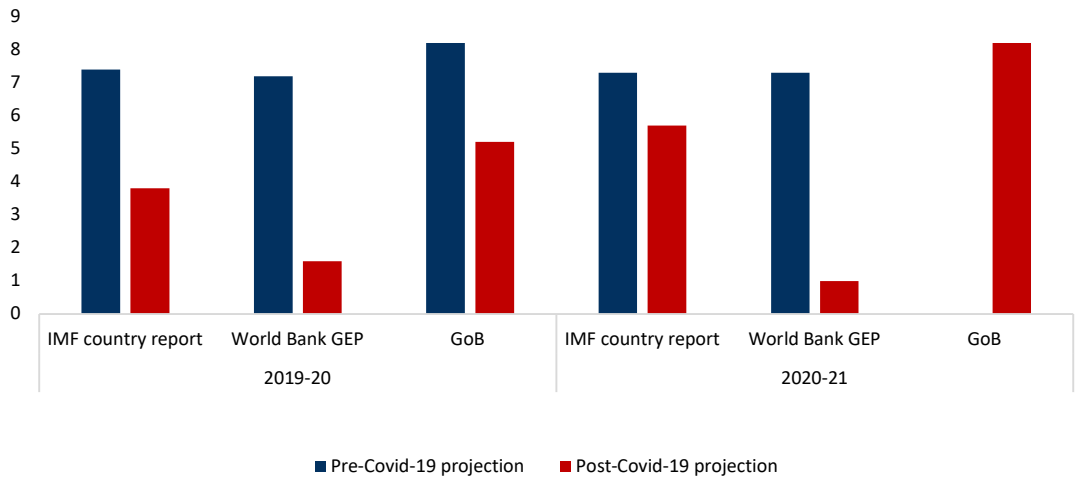
II. Covid-19 induced macro and socio-economic consequences for Bangladesh

Bangladesh made an impressive socio-economic progress over the past several decades prior to Covid-19. The average annual growth of GDP since 2000 had been 6.3 per cent with the dynamism in economic activities being more robust in recent years. During the same period, the per capita GDP rose from around $400 to more than $1,900. The headcount poverty incidence since the early 1990s declined at an average annula rate of 1.34 per cent as the propriotion of the poulation living below the poverty line came down from more than 50 per cent to 20.5 per cent in 2018-19. The rising per capita income had enabled the country in 2015 to climb up to the ranks of 'lower-middle-income' countries from the 'low-income' category, as classified by the World Bank. In 2018, Bangladesh for the first time met the criteria for graduation from the group of least developed countries (LDCs) and was expected to fulfil the criteria again in 2021, paving its official graduation from LDC status in 2024.[1]

In the aftermath of of the Covid-19 global pandemic, however, curtailed economic activities manifested in factory closures, massive loss of employment, cancellation of export orders, and depressed demand for domestically produced goods and services had caused massive disruptions affecting most population groups and leading to a dramatic rise in poverty and vulnerability. While the IMF and World Bank drastically downgraded their pre-Covid growth forecast of above 7 per cent in 2019-20 to 3.8 per cent and 1.6 per cent, respectively, the government of Bangladesh maintained a much lower impact by revising the GDP growth to 5.24 per cent. For 2020-21, the IMF and World Bank growth forecasts for the country are 5.7 per cent and 1.7 per cent, respectively, the government has set a growth of 8.2 per cent (Figure 3).

[1] Graduation from LDCs requires a country to meet development thresholds under at least two of the three pre-defined criteria (of per capita income, human asset and economic vulnerability) in two consecutive triennial reviews. Bangladesh achieved graduation qualification by satisfying all the three thresholds. It is to be noted that there is also a provision of the "income-only" graduation rule under which if the three-year average per capita GNI of an LDC has risen to a level of at least double the graduation threshold, the country would be eligible for graduation regardless of its situation under the other two criteria..

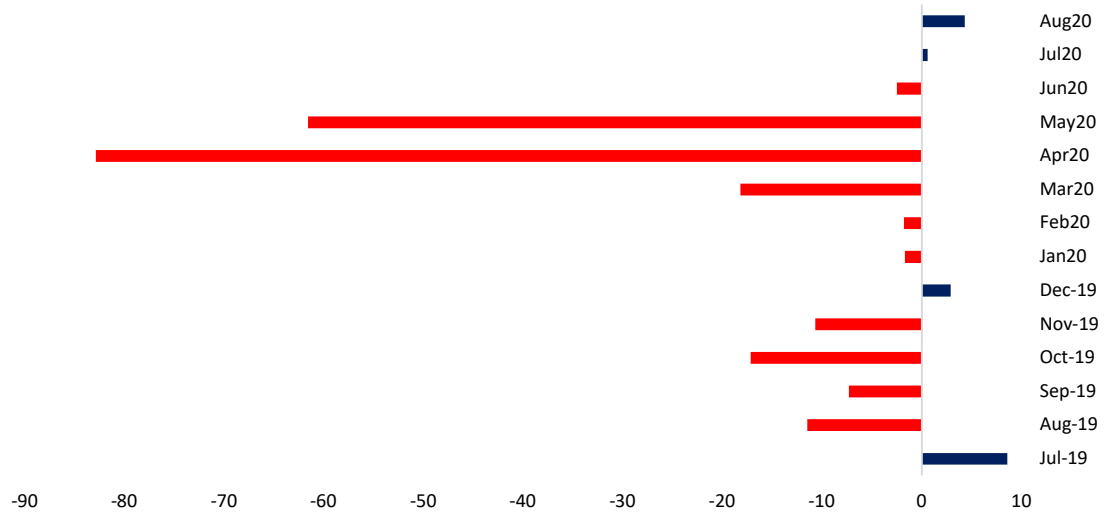
Figure 3: Projection of GDP growth in Bangladesh (%)



Note: GEP – Global Economic Prospects (of the World Bank).
Source: Author's presentation using data from the IMF, World Bank, and Government of Bangladesh sources.

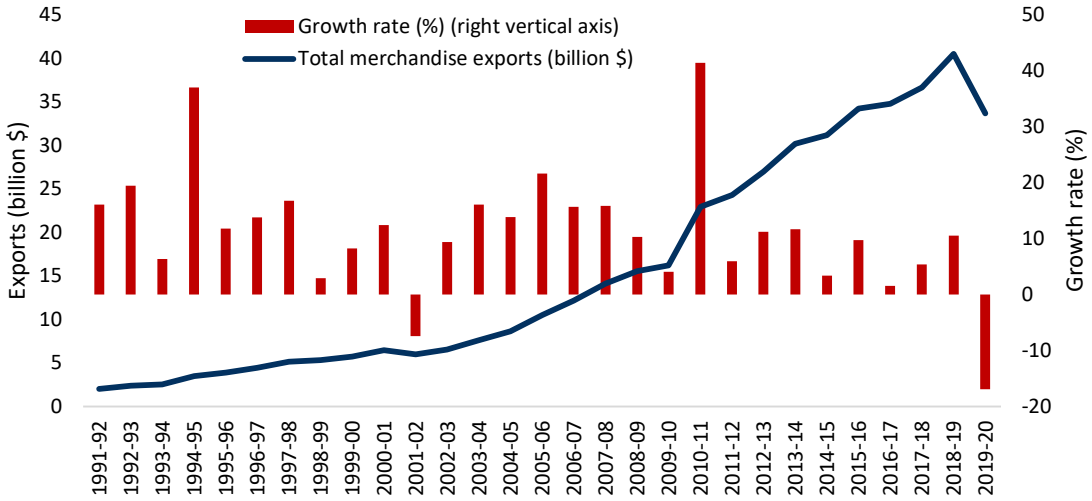
Export earnings were severely affected: export shipments in April 2020 were 83 per cent and in May 2020 were 66 per cent lower compared with the same months of the previous year (Figure 4). Although the export earnings for June were much higher than anticipated, the overall exports for 2019-20 were 17 per cent lower than the previous year (Figure 5). The weakness in world trade flows is likely to persist as the World Trade Organisation (WTO) projects the global trade in 2020 be 13 – 32 per cent lower than that of the previous year (Figure 6). However, Bangladesh saw some recovery in export receipts as July – September 2020 earnings registered a modest 3 per cent growth of the past year. This much-better-than-anticipated performance has been due to several factors. Some of the lost export orders during March – June 2020 were regained. This might have also been boosted by the relocation of China's export orders due to its ongoing trade war with the United States.

Figure 4: Overall export growth rates, month-to-month



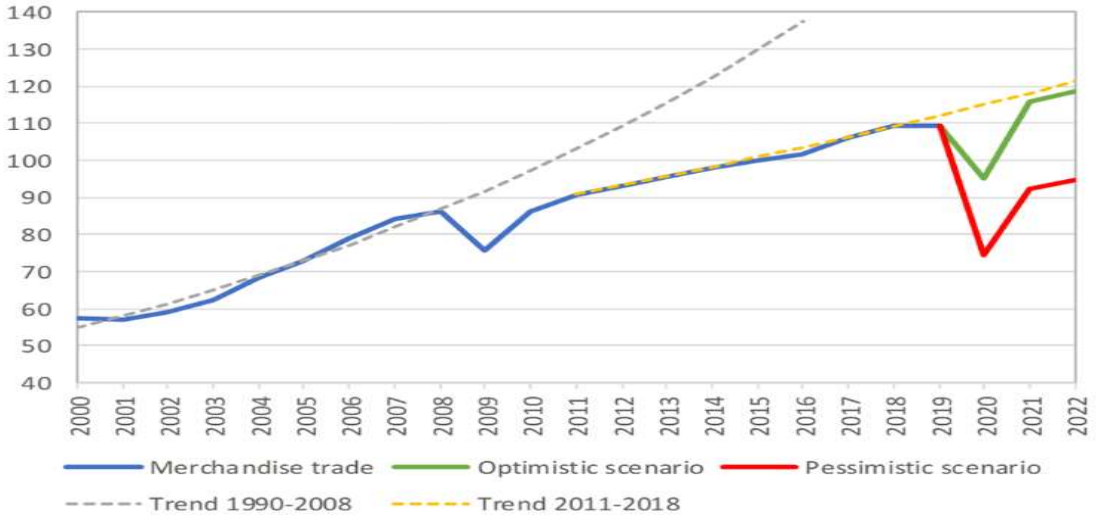
Source: Authors' presentation using data from the Export Promotion Bureau of Bangladesh (EPB).

Figure 5: Bangladesh: export earnings and growth



Source: Authors' analysis using data from the Export Promotion Bureau of Bangladesh (EPB).

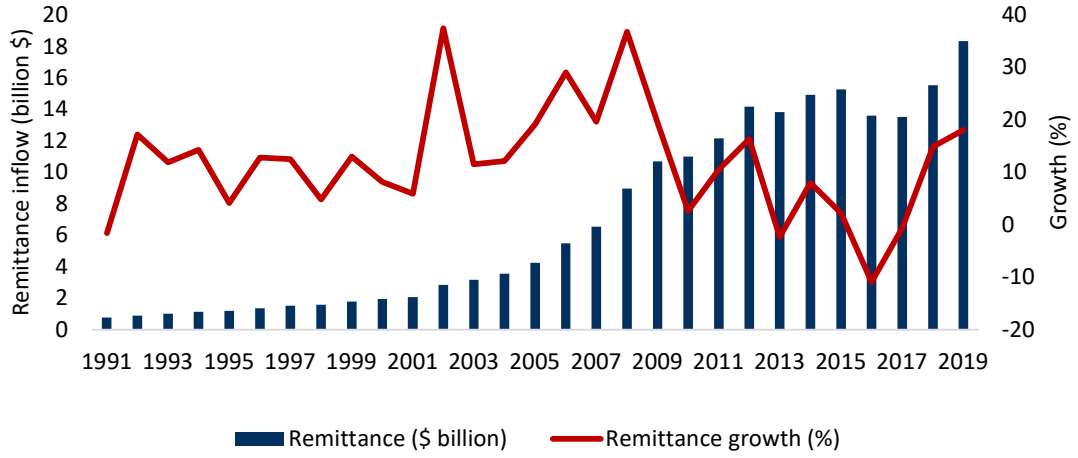
Figure 6: Projection of world merchandise trade



Source: World Trade Organization (WTO, 2020)

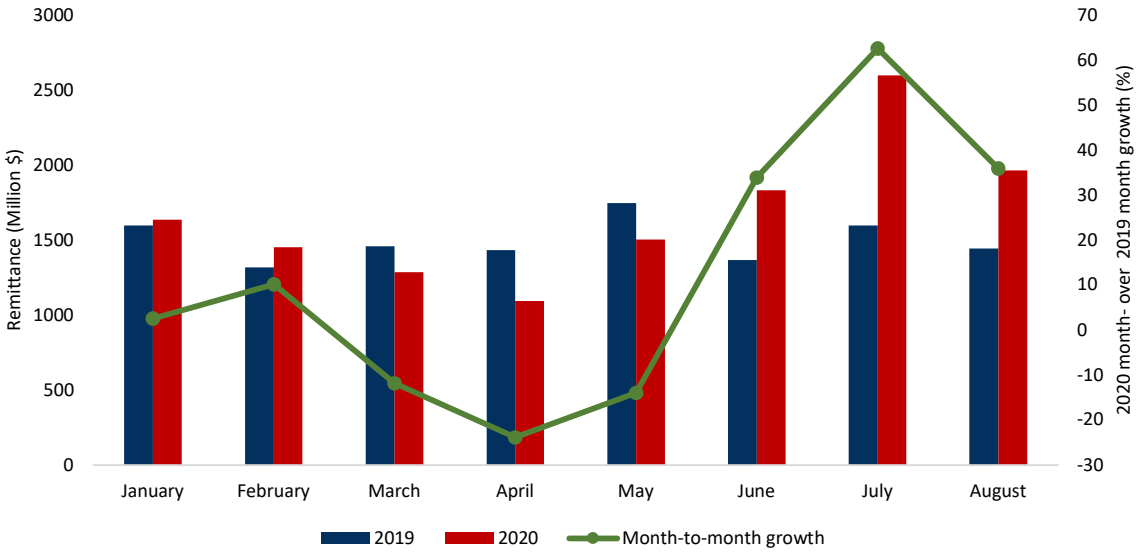
Remittances are important sources of income for many households in Bangladesh. Since 2000, the inflow of Remittances had increased from less than $2 billion to more than $18 billion in 2019 (Figure 7). In the immediate aftermath of Covid-19 shock, during March-May, remittances were subdued followed by rather surprising spikes during June – September 2020. Amongst others, it is possible that because of fiscal incentives provided by the government and due to disruptions caused in informal (e.g. hundi network) mechanisms, more remittances were being sent through formal channels. Nevertheless, the short–medium term prospects for remittances remain weak with the World Bank suggesting a decline of remittances by as much as 22 per cent in 2020.

Figure 7: Inflow of remittance in Bangladesh



Source: Authors' presentation using data from BMET and Bangladesh Bank

Figure 8: Remittance inflows in Bangladesh

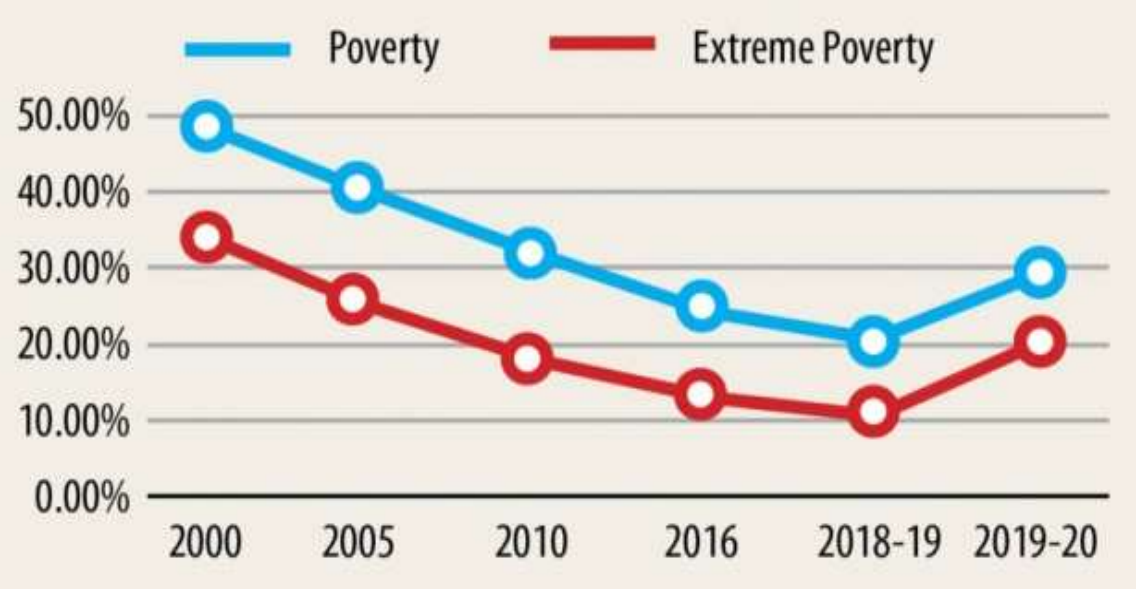


Source: Authors' presentation using data from BMET and Bangladesh Bank.

The economic shutdown measures imposed to contain the virus causing supply-side disruptions and weaknesses in domestic and external demand for goods and services had resulted in massive income and job lossess for different population groups. In the absence of large-scale nationally representative surveys, various estiamtes and prjections suggested the temporary job loss being in the range 12–17 million (Mansur et al. 2020). In Bangladesh, the official poverty estimates come from a national household survey undertaken once around every five-year by the Bangladesh Bureau of Statistics (BBS), the government statistical agency. The latest such survey-based estimate of poverty incidence is available for 2016 and there have been no attempts by the BBS to undertake any national survey to assess the poverty implications for Covid-19. Some rapid primary surveys conducted by the BRAC Institute of Governance and Development (BIGD) and simple calculations of likely reductions in

incomes from the national Household Income and Expenditure Survey (HIES) 2016 by various think thanks put the proportion of the population living below the poverty line in the aftermath of Covid-19 in the range 33–44 per cent (i.e. 13 – 24 percentage points rise from around 20 per cent from 2018-19). Subsequently, having reviewed the situation, the BBS and Planning Commission suggested that the poverty incidence to rise by 10 percentage points (Figure 9).

Figure 9: Rise in poverty and extreme poverty



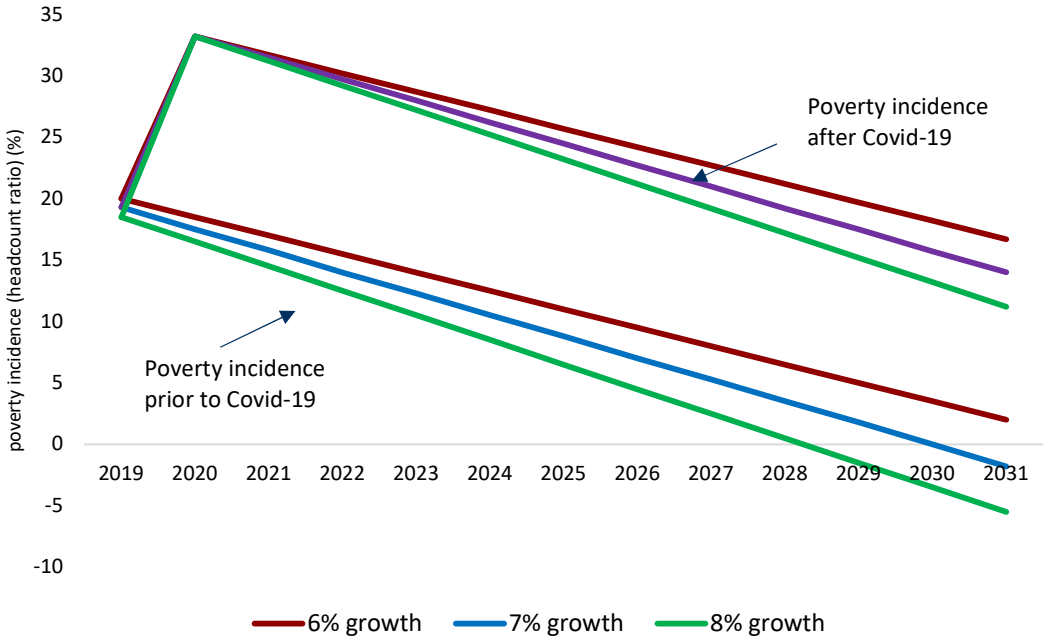
Source: The Daily Star (12 August, 2020), *Pandemic Doubles Extreme* Poverty, report by Sohel Parvez, available at https://www.thedailystar.net/business/news/pandemic-doubles-extreme-poverty-1943653#:~:text=The%20recent%20nationwide%20closure%20of,the%20Planning%20Commission%20(PC).

It is not clear if this increase in poverty will be temporary in nature, in which case, the economic recovery could help reduce or eliminate the rise at a faster pace. Any permanent rise in poverty incidence could be more difficult to address. In any event the nature of recovery (e.g. whether it would be a quick bounce-back or a slow and bumpy one) and how pro-poor the future growth process is going to be will eventually determine the time needed for poverty incidence to go back to the situation of the pre-pandemic level (Razzaque, 2020). The existing estimates of growth elasticity of poverty (GEP) – defined as the percentage reduction in poverty rates associated with a percentage change in GDP – can help assess the time required to reduce/eliminate poverty given the expected growth performance of an economy. An estimation by Sen et al. (2020), based on various possible GDP growth scenarios, suggests that it might now take 7 to 10 more additional years for Bangladesh to eliminate poverty by 2030 (Figure 10).

However, it is worth noting that if Covid-19 induced poverty rise is a temporary phenomenon, poverty reduction could be faster than what could be inferred using the historical growth elasticity of poverty. For Bangladesh, one pertinent question is when GDP growth are high for two consecutive years – 5.24 per cent in 2019-20 and anticipated 8.2 per cent for 2020-21 – if it is possible for poverty to rise and sustain at such a high level. Covid-19-related disruptions would imply the economy to operate at a level lower than what can be considered as the baseline and/or anticipated level. It is then important to know to what extent the deviation will be associated with any changes in poverty. Therefore,

growth and poverty assessments should be undertaken through a macroeconomic and data-consistent framework to derive the relevant policy implications.

Figure 10: Projections of poverty rate based on different growth rate scenario



Source: Sen, Ali, and Murshed (2020).

III. Methodology

3.1 Transmission Channels

The socio-economic impact of Covid-19 on the economies worldwide is being transmitted through depressed domestic demand, disrupted supply response in the local economy, and slowdown in global economic activities affecting global trade and international financial flows. Much of the econimic costs of pandemic is due to individuals' preventive behaviour and the transmission control policies of the government (Brahmbhatt and Dutta, 2008). By the end of September 2020, Covid-19 caused deaths of more than one million people while infacting more than 34 million worldwide. Countries implementing different transmission conrtrol mechanisms including broader closures, transport restrictions, social distancing, lockdown/shutdown measures etc. directly or indierectly affect peoples' economic and social activities. There have been several studies disucssing the interlinked transmission mechanism of the socio-economic impacts of Covid-19.

One early study that analysed the potential impact of Covid-19 on the global economies is due to the World Bank (Maliszewska, et al, 2020). The study considered four major channels of transmission— i) the direct impact of a reduction in employment; ii) the increase in costs of international transactions;

iii) the sharp drop in travel and tourism; and iv) the decline in demand for services that require close proximity between people. Utilising a multi-regional computable general equilibrium modelling framework (the GTAP model), the study assumes that the immediate unemployment consequences of Covid-related business closures and negative demand shock will have left 3 per cent of the labor force underutilized on average over the whole year across all sectors of the economy.

Subsequently, the Asian Development Bank (ADB), also using the GTAP framework, undertook a different approach in which several known measurable channels of transmission were considered. These include, (i) an increase in trade costs that affects the movement of people and inbound tourism, along with industries linked to global supply chains; (ii) a negative supply-side productivity shock that cuts wages and corporate earnings, leading to reductions in consumption and investment; and (iii) fiscal stimulus through various macroeconomic policy instruments (ADB, 2020). According to this study, the first channel accounts for border control restrictions and air travel bans adopted by most countries. These border restrictions and travel bans escalated the cost of trade in services, particularly aviation and outbound and inbound tourism. The second channel is due to government restrictions on mobility through community quarantine and lockdowns, social distancing etc. that affect both the demand and supply sides of the economy. The final channel accounts potential impact of government policy responses through direct support to income and revenue through supplementary budgets, fiscal stimulus, tax cuts, or tax deferrals.

UNCTAD (2020a) asserted the basic routes of economic impact as demand and supply-side disruptions, and uncertainty in the liquidity market. In a recent study, the Food and Agriculture Organization (FAO) analyses the channels of transmissions into the food and agriculture sectors. According to this study, transport restriction, unusual delays in customs clearance, lack of credit, higher interest rates and capital costs make inputs very pricey (Schmidhuber et al, 2020). Labour-dependent agricultural economies will have to compromise regular yield for labor shortages—owing to illness, fear to be contaminated at work, societal lockdown, etc. Exchange rate fluctuations will affect both quantity and prices of food and could make them inaccessible to domestic consumers, while export controlling would result in supply shortage and soaring food prices. Downward energy prices in energy markets during the pandemic conveyed its impact up until agricultural systems emerged in demand contraction as well as supply side narrowing. Worldwide food demand is likely to stagnate or even decline given the expected contraction in global GDP, while demand in the non-food sector is likely to rise. Exposures to borrowing costs would amplify the competitiveness of supplies from high-income and weigh on competitiveness of producers in low-income countries. With rising capital costs and volatile credit-markets, capital-based production in developing countries would be adversely affected. All these channels directly or indirectly affect activities in food and agriculture sector.

The COVID-19 pandemic has affected the global economy in every aspect; from supply to demand, in the short and long run, globally and domestically. The present study attempts to assess the overall socio-economic impact on Bangladesh based on measurable transmission channels. Our analysis incorporates five such transmission channels namely – i) a demand-side disruption arising from unemployment and reduction in households and corporate earnings leading to a fall in consumption and investment; ii) a sharp decline in domestic and international travel and tourism; iii) a drop in

energy prices; iv) a trade shock affecting overall economic activities; and v) fiscal policy measures of the government.

The first channel arises from government restriction on mobility and transmission conrtrol mechanism, social distancing, lockdown/shutdown measures, community quarantine etc. All these measures affect both demand and supply side of the economy. On the demand side, reduced earnings due to factory closure, reduced working hours, unemployment etc. can suppress the private demand. Besides, frightened public-sentiment, possible layoffs can reduce household spending and increase economic insecurity for those who do not have access to a social safety net (UNCTAD, 2020a). These can weaken the private demand in the short- to medium-run. The economic uncertainty and lower private demand will further cut down private investment. External private investment is undergoing under severe strain as the economic fallout of Covid-19 has led to capital flight. The projection exercise by Institute of International Finance (IIF) (2020) shows that portfolio and other investment flows could decline by 80 per cent. UNCTAD's World Investment Report 2020 states that the coronavirus pandemic has caused a steep drop in investment flows and has hit developing countries the hardest. It projects that global foreign direct investment will shrink up to 40 percent in 2020 (UNCTAD, 2020b).

On the supply side, economic shutdown measures, travel and transport restrictions affected the supply chain badly. These measures led to a severe disruptions to the supply-side of the world economy due to factory closure and complete or partial shutdown of services activities. The pandemic affected the labour market as a proportionately large portion of the labour force are likely to experience severe disruptions in their activities. The consequences of the loss of employment and working hours will further add to the supply-side disruptions. The consequences of disruptions on the supply side can contaminate aggregate demand (UNCTAD, 2020a), further reducing private spending.

Modeling implementation can undertake either demand side or supply side approach. The World Bank analysed the potential impact by utilysing supply-side approach while incorporating an employment shock in the simulation exercise. On the other hand, ADB (2020), considered the demand-side approach to estimate the overall impact by providing shocks on the component of aggregate demand. In our modeling implementation, we undertook the demand side approach as the supply-disruption will be reflected in the aggregate demand.

The second channel accounts the decline in domestic and international travel and tourism activities. It is worth pointing out that international tourist arrivals are anticipated to decline by 58 – 78 per cent in 2020 (UNWTO, 2020). Domestic and international air transport was paused for several months in Bangladesh and all major global economics. Domestic and international air transport resumed at a limited scale. Airline seat capacity is estimated to have reduced by 50 per cent to 62 per cent in 2020 (ICAO, 2020). The World Bank Study incorporated the tourism shock by imposing a consumption tax on transport and tourism related services. In modeling exercise, we also implemented a similar approach where the reduction in travel and tourism activities are incorporated by imposing a consumption tax on domestic and international tourism.

The third channel of transmission is the shock on fuel price. A considerable decline in fuel price particularly the price of crude oil has been observed since the onset Covid-19 of the pandemic. According to UNCTAD's free market commodity price index (FMCPI), prices of fuel - exported by

developing economies declined by a whopping 33 per cent in March compared to the same month in the previous year. Quite strikingly, the prices of crude oil became negative in April, which however recovered but remains much below the pre-Covid price level. The oil price shock can have both positive and negative impact depending on the nature of the economies. For oil producing and exporting countries, the decline in prices will have high negative implications on domestic economies and trade. For oil importers, on the other hand, the negative price shock will exert beneficial impacts. For Bangladesh, as the price of oil is controlled by the Bangladesh Petroleum Corporation, the price shock is expected to have low or no effect on the major macroeconomic variablesalthough a postive effect through favourable changes in trade balance is expected. Subdued oil prices have other major advese consequences for Bangladesh. This is because about two-thirds of Bangladesh's remittance are sourced from the oil dependent Middle-Eastern countries and a depressed economic situation in those countries owing to reduced oil prices can affect migrant workers' incomes. The authorities in Saudi Arabia – the largest destination of Bangladesh's migrant workers – have already decided to cut wages by about 25 per cent to 50 per cent due to stagnant economic activities. The oil price shock in the model has been incorporated by directly slashing the world price of crude oil.

The fourth transmission channel incorporates the rise in international trade cost of exports and imports. Additional inspections, reduced hours of operation, road closures, border closures, increases in transport costs, etc. contribute to trade transport and transaction costs in international trade (Maliszewska, et al, 2020). The final channel of transmission is the potential impact of government fiscal response to minimise the adverse economic consequances. Most global economies have announced sizeable fiscal support for economic recovery in the form of direct cash assistance, working capital support, wage subsidies for domestic and export oriented industries, tax reduction and tax deferrals, etc. .

3.2 Use of GTAP Model

The Global Trade Analysis Project (GTAP) model utilised in this paper is a widely used computable general equilibrium (CGE) comprative static framework (Hertel, 1997) for undertaking wide-ranging analysis of the likely impact (ex ante) of various policy changes and shocks on economic performance indicators. As mentioned above, studies using the same modelling methodlogy to assess the potential impact of Covid-19 shocks on global/regional economies by considering two different routes. In one route – as taken in ADB (2020) – shocks are introduced to the demand side by decreasing consumption and investment, while the other approach – employed in Maliszewska *et al.* (2020) World Bank Policy Research Working Paper – introduces an uniform unemployment shock across countries to depict the supply-side disruptions. In both cases, international trade and tourism shocks have been added sepatately by raising the cost of imports and exports and tourism activities.

In the present study, two different approaches are employed to study the impact on Bangladesh. First, the consumption demand shocks along with international trade and tourism disruptions are introduced for all global economies (including Bangladesh).[2] This is the so-called 'top-down' route to

[2] When countries first imposed economic shutdown measures, considering unemployment shocks was justified. However, after the withdrawal strict containment and social distancing measures, introducing a uniform unemployment shock across the countries could be considered unrealistic and thus is not considered here.

capture the supply-side consequences i.e. a demand-side shock depicting reduced production activities as well. In the other approach, a more Bangladesh-specific modelling exercise is adopted. Here, the global economic slowdown or recession induced by Covid-19 affecting Bangladesh is considered as exogenous shocks arising from declining growth of global economies. On the other hand, domestic disruptions are introduced through aggregate demand shocks emanating from reduced consumption, investment, and trade transactions.

More specifically, the global modeling approach incorporates, based on the review of different transmission channels as discussed above, four sets of shocks: (i) the consumption demand shock for all economies, (ii) a tourism shock that cuts domestic and international tourism and related activities, (iii)an oil price shock , and (iv) a trade shock that raises the cost of exports and imports. The demand prospects for global economies have been surveyed from different studies to build low, medium and high shock scenarios (Table 1). In introducing demand shocks, domestic private consumption in Bangladesh is considered to decline by 2 per cent, 3.5 per cent and 7 per cent under low, medium, and high shocks scenarios, respectively.[3] The decline in global tourism activities is modelled by a consumption tax on tourism-related services i.e. transport, accommodation and recreation services. The cost of tourism-related services is increased by raising the tax rates by 10 per cent for domestic tourism and 20 per cent for international tourism under the low-shcok scenario. The corresponding tax rates are increased by 15 per cent and 30 per cent under the medium shock scenario and by 20 per cent and 40 percent under the high shock scenario. From a review of various analyses, the oil prices are thought to be 10, 15 and 20 per cent weaker under the three different scenarios. As discussed earlier, the oil price shocks can have both positive and negative impacts depending on the countries' being net importers or exporters of petroleum products. Finally, the disruptions in global trade are incorporated by considering higher trade costs for exports and imports. It is assumed that trade costs rise by 1.5 per cent, 2.5 per cent and 5 per cent under low, medium and high shcoks scenarios, respectively. All the shocks are assumed to occur simultaneously. The final impact in the global modeling approach is the cumulative impact of all four sets of shocks.

Table 1: Shocks in the GTAP model

Shocks	Low shock scenario	Medium shock scenario	High shock scenario
Consumption shock (decline in private consumption of all final goods is modelled)	BGD -2; BRA -4; CAN -5; CHN -5; JPN -3; IND -4; KOR -3; UK -5; USA -6.5; EU_27-5; TUR -4	BGD -3.5 BRA-5.5; CAN -6.5; CHN -6; JPN -5; IND -5; KOR -5; UK -7; USA -7.5; EU_27 -7; TUR -6;	BGD -7 percent; BRA -7; CAN -8; CHN -7; JPN -7; IND -7; KOR -6.5; UK -8.5; USA -9; EU_27 -8.5; TUR -7.5;
Oil price shock (oil price shock that reduces cost of inputs)	10 % shock on oil price	15 % shock on oil price	25 % shock on oil price
Tourism shock (higher trade costs bring down tourism receipts)	10 per cent shock on domestic tourism and 20 per cent on international tourism	15 per cent shock on domestic tourism and 30 per cent on international tourism	20 per cent shock on domestic tourism and 40 per cent on international tourism

[3] This has been set based on the review of various studies and the authors' assessment of demand contraction for the the whole year rather than the peak crisis period only. The demand contraction for other global economies are based on a survey of the existing studies and analyses.

International trade shock (the cost of international trade rises for all region)	A 1.5 per cent increment in trade cost	A 2.5 per cent increment in trade cost	A 5 per cent increment in trade cost

Source: authors' review of literature and own assessments.

In the Bangladesh-focused modelling exercise, the exogeneous output shocks of partner countries have been introduced by surveying GDP growth projections for individual economies by the World Bank and IMF (Table 2). The domestic disruptions have been incorporated using the consumption and investment shocks as well as tourism shocks. The weakness in investment prospects is considered as a 10 per cent, 20 per cent, and 25 per cent fall in total investment under low, medium and high shock scenarios, respectively. The shocks for consumption, tourism, oil price and international trade flows are the same for Bangladesh as used in the global model described above.

Table 2: GDP sgrowth for individual economies (%)

	Low shock scenario	Medium shock scenario	High shock scenario
AUS	-2.6	-4.4	-5.5
BRA	-4.8	-8.0	-10.0
CAM	-0.6	-1.0	-1.3
CAN	-5.0	-8.4	-10.5
CHN	2.0	1.0	-1.0
HKG	-2.9	-4.8	-6.0
IND	-1.9	-3.2	-4.0
IDN	2.0	0.0	-2.0
JPN	-3.5	-5.8	-7.3
KOR	-1.3	-2.1	-2.6
MAL	-1.9	-3.1	-3.9
PAK	1.0	0.0	-1.0
PHL	-1.1	-1.9	-2.4
RUS	-3.6	-6.0	-7.5
SGP	-2.1	-3.5	-4.3
THA	-3.0	-5.0	-6.3
TUR	-2.3	-3.8	-4.8
UK	-6.1	-10.2	-12.8
USA	-3.7	-6.1	-7.6
VNM	1.7	2.8	3.5
EU_27	-5.5	-9.1	-11.4
RestAsia	-0.6	-1.0	-1.2
LatinAmer	-4.3	-7.2	-9.0
MENA	-2.5	-4.2	-5.3
SSA	-1.7	-2.8	-3.5
RestofWorld	-2.7	-4.5	-5.6

Source:

Finally, policy response simulations have been incorporated under each scenario to assess the impact of government interventions through fiscal stimulus packages. Most global economies have rolled out sizeable fiscal and financial schmese to support their producers, consumers and workers. As part of this paper, all such support has been categorised into direct income support to consumers, working capital assistance to firms, and wage support and other incentives to enterprises and are used in the model as support to to consumers (as subsidy), labour (as wage input into production) and producers (e.g., as working capital to firms contributing to production).

The GTAP framework used in this exercise incorporates all standard features of the model including competitive markets and homogeneous technology. The Armington assumption is employed for

traded commodities (i.e. goods are imperfect substitutes). Consumers maximise their utility following a CES function and a linear budget constraint. Factors of productions include land, labour, capital and natural resources with labour being disaggregated into skilled and unskilled. The standard GTAP framework is a full-employment model, however, this usual assumption (of full employment) is relaxed to allow for unemployment. The GTAP model comes with an integrated database with the current version (version 10) having the base year as 2014. The runGTAP software has the flexibility to update the base data. In our exercise, the GTAP 2014 data are updated to 2020 using the cumulative growth rate of real GDP for the respective regions while trade balance is considered fixed. The updated database is also cross-checked with the real data for validation purpose. Then the updated 2020 data are considered as the baseline. There are 65 sectors (45 goods and 20 services sectors) and 141 regions/countries in the latest version which have been aggregated to 27 regions/countries and 24 sectors (Table 3 and Table 4, respectively) to closely reflect the Bangladesh situation.

Table 3: GTAP regional aggregation used in this study

Model aggregation	GTAP region
Australia	Australia (AUS)
Bangladesh	Bangladesh (BGD)
Brazil	Brazil (BRA)
Cambodia	Cambodia (CAM)
Canada	Canada (CAN)
China	China (CHN)
Hong Kong	Hong Kong (HKG)
India	India (IND)
Indonesia	Indonesia (IDN)
Japan	Japan (JPN)
Malaysia	Malaysia (MAL)
Pakistan	Pakistan (PAK)
Philippines	Philippines (PHL)
Russia	Russia (RUS)
Singapore	Singapore (SGP)
South Korea	South Korea (KOR)
Thailand	Thailand (THA)
Turkey	Turkey (TUR)
United Kingdom	United Kingdom (UK)
United States of America	United States of America (USA)
Vietnam	Vietnam (VNM)
European Union 27	Austria (AUT), Belgium (BEL), Bulgaria (BGR), Croatia (HRV), Cyprus (CYP), Czech Republic (CZE), Denmark (DNK), Estonia (EST), Finland (FIN), France (FRA), Germany (DEU), Greece (GRC), Hungary (HUN), Ireland (IRL), Italy (ITA), Latvia (LVA), Lithuania (LTU), Luxembourg LUX), Malta (MLT), Netherlands (NLD), Poland (POL), Portugal (PRT), Romania (ROU), Slovakia (SVK), Slovenia (SVN), Spain (ESP), Sweden (SWE)
Latin America and Caribbean	Argentina (ARG), Bolivia (BOL), Chile (CHL), Colombia (COL), Ecuador (ECU), Paraguay (PRY), Peru (PER), Uruguay (URY), Venezuela (VEN), Rest of South America (XSM), Costa Rica (CRI), Guatemala (GTM), Honduras (HND), Nicaragua (NIC), Panama (PAN), El Salvador (SLV), Rest of Central America (XCA), Dominican Republic (DOM), Jamaica (JAM), Puerto Rico (PRI), Trinidad and Tobago (TTO), Caribbean (XCB)
Middle East and North Africa	Bahrain (BHR), Islamic Republic of Iran (IRN), Israel (ISR), Jordan (JOR), Kuwait (KWT), Oman (OMN), Qatar (QAT), Saudi Arabia (SAU), United Arab Emirates (ARE), Rest of Western Asia (XWS), Egypt (EGY), Morocco (MAR), Tunisia (TUN), Rest of North Africa (XNF)

Sub-Saharan Africa	Benin (BEN), Burkina Faso, (BFA), Cameroon (CMR), Cote d'Ivoire (CIV), Ghana (GHA), Guinea (GIN), Nigeria (NGA), Senegal (SEN), Togo (TGO), Rest of Western Africa (XWF), Central Africa (XCF), South Central Africa (SAC), Ethiopia (ETH), Kenya (KEN), Madagascar (MDG), Malawi (MWI), Mauritius (MUS), Mozambique (MOZ), Rwanda (RWA), Tanzania (TZA), Uganda (UGA), Zambia (ZMB), Zimbabwe (ZWE), Rest of Eastern Africa (XEC), Botswana (BWA), Namibia (NAM), South Africa (ZAF), Rest of South African Customs (XSC)
Rest of Asia	Mongolia (MNG), Taiwan (TWN), Rest of East Asia (XEA), Brunei Darussalam (BRN), Lao People's Democratic Republic (LAO), Rest of Southeast Asia (XSE), Nepal (NPL), Sri Lanka (LKA), Rest of South Asia (XSA)
Rest of World	New Zealand (NZL), Rest of Oceania (XOC), Mexico (MEX), Rest of North America (XNA), Switzerland (CHE), Norway (NOR), Rest of EFTA (XEF), Albania (ALB), Belarus (BLR), Ukraine (UKR), Rest of Eastern Europe (XEE), Rest of Europe (XER), Kazakhstan (KAZ), Kyrgyzstan (KGZ), Tajikistan (TJK), Rest of Former Soviet Union (XSU), Armenia (ARM), Azerbaijan (AZE), Georgia (GEO), Rest of the World (XTW)

Source: Authors' aggregation.

Table 4: GTAP sectoral aggregation used in this study

Model aggregation	GTAP sector
Grains and Crops	Paddy rice (PDR), Wheat (WHT), Cereal grains nec (GRO), Vegetables, fruit, nuts (V_F), Oil seeds (OSD), Sugar cane, sugar beet (C_B), Plant-based fibers (PFB), Crops nec (OCR), Processed rice (PCR)
Livestock and Meat Products	Bovine cattle, sheep and goats (CTL), Animal products nec (OAP), Raw milk (RMK), Wool, silk-worm cocoons (WOL), Bovine meat products (CMT), Meat products nec (OMT)
Forestry and Fishing	Forestry (FRS), Fishing (FSH)
Coal	Coal (COA)
Oil	Oil (OIL)
Gas	Gas (GAS)
Other Extraction	Minerals nec (oxt)
Heavy Manufacturing	Petroleum, coal products (P_C), Chemical products (CHM), Rubber and plastic products (RPP), Mineral products (NMM), Ferrous metals (I_S), Metals nec (NFM), Computer, electronic and optic (ELE), Electrical equipment (EEQ), Machinery and equipment nec (OME)
Light Manufacturing	Wood products (LUM), Paper products, publishing (PPP), Metal products (FMP), Motor vehicles and parts (MVH), Transport equipment nec (OTN), Manufactures nec (OMF)
Processed Food	Vegetable oils and fats (VOL), Dairy products (MIL), Sugar (SGR), Food products nec (OFD), Beverages and tobacco products (B_T)
Wearing apparel	Wearing apparel (WAP)
Textiles	Textiles (TEX)
Leather products	Leather products (LEA)
Basic pharmaceutical products	Basic pharmaceutical products (BPH)
Utility	Electricity (ELY), Gas manufacture, distribution (GDT), Water (WTR)
Construction	Construction (CNS)
Accommodation	Accommodation, Food and service (AFS)
Transportation	Air transport (ATP), Water transport (WTP), Transport nec (OTP)
Communication	Communication (CMN)
Insurance and Financial services	Insurance (INS), Financial services nec (OFI)
Recreation	Recreational and other service (ROS)
Education	Education (EDU)
Health	Human health and social work (HHT)

Other Services	Trade (TRD), Warehousing and support activities (WHS), Real estate activities (RSA), Business services nec (OBS), Public Administration and defense (OSG), Dwellings (DWE)

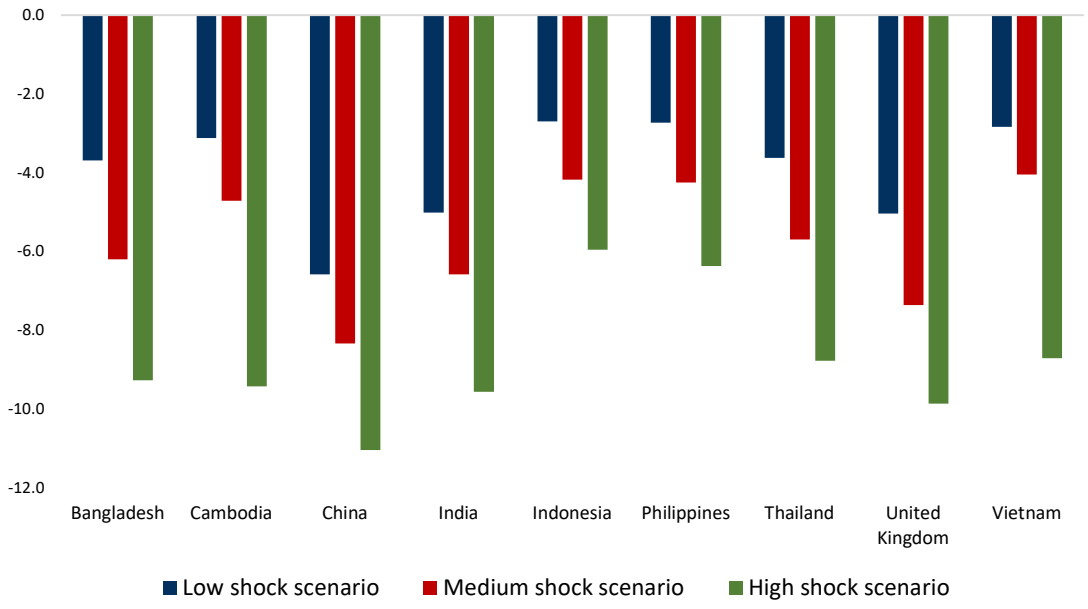
Source: Authors' aggregation.

IV. Simulation Results

4.1 Results from the Global Modeling Approach

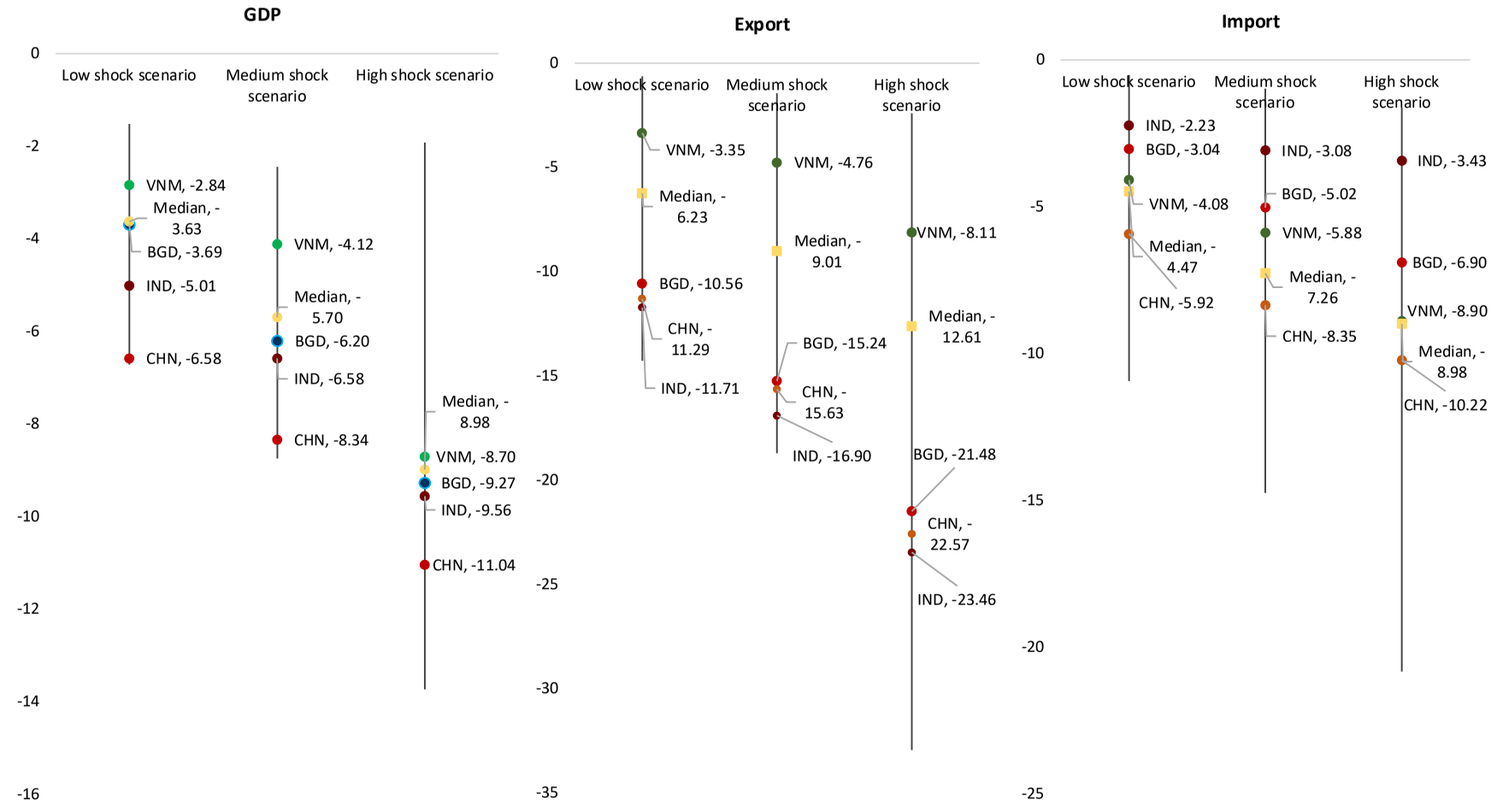
The simulation results obtained from introducing shocks to all individual global economies are discussed first. Figure 11 and Annex Table A1 summariese the impact on GDP for several countries. Under a low-shock scenario, the simulated GDP for Bangladesh in 2020 is $11 billion (3.7%) lower than the baseline level in the absence of Covid-19. China (6.6%) and India (5%) suffer from higher levels of reduction from their respective baselines, whie the comparable impacts are lower for Cambodia (3.1%), Indonesia (2.7%) and Vietnam (2.8%), amongst others. The impacts under medium and high shock scenarios are much higher: 6.2 per cent and 9.3 per cent lower than the baseline for Bangladesh; 6.6 per cent and 11 per cent lower in China; 6.6 and 9.6 per cent for India. Within the set of global economies, Bangladesh, China and India, amongst others, are having higher than average (median) reduction in domestic activities (Figure 12). Under the low-shock scenario, Bangladesh will experience a 10 per cent fall in exports, while for medium and high scenarios this will rise to 15 per cent and 21 per cent, respectively. While China's export loss is comparable to Bangladesh under each scenario, the corresponding declines for India are slightly higher (Figure 12). The median export loss for the global economies are estiamted to be 6 per cent, 9 per cent and 13 per cent, respectively, under the low, medium and high shock scenarios.

Figure 11: COVID-19 impact on GDP (% of deviation from the baseline)



Source: Authors' estimation using GTAP.

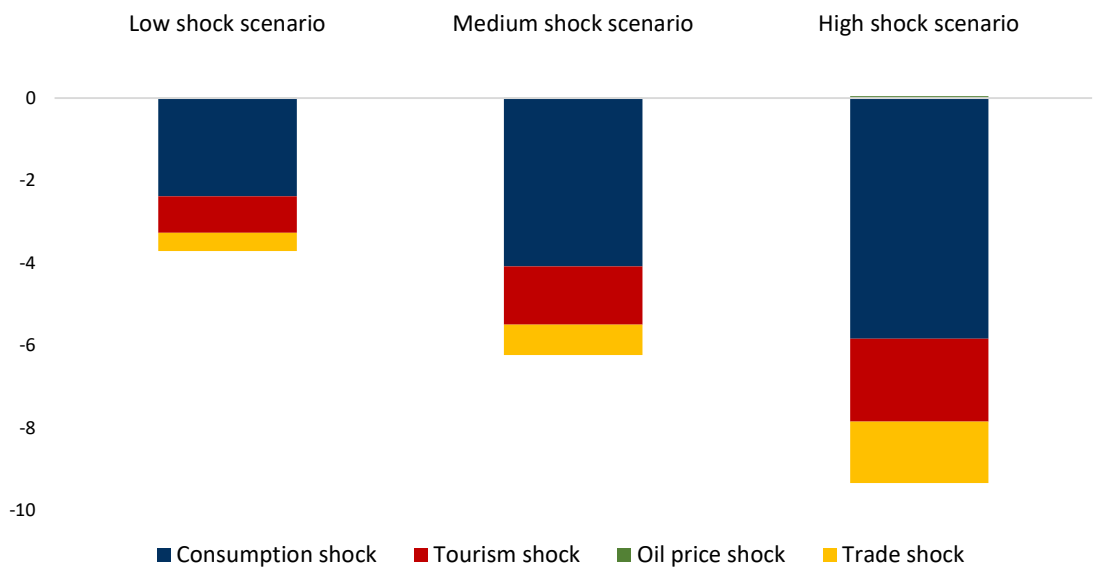
Figure 12: A summary of the impact of COVID-19 on GDP, exports and imports



Source: Authors' estimation

The cumulative final impact enables us to decompose the contribution of each shock on overall changes in GDP. It is found that under each scenario, the aggregate demand disruptions captured by the consumption shock accounts more than 60 per cent of total contraction in Bangladesh's GDP (Figure 13). About 21 per cent to 24 per cent of overall slump in GDP is due to closure of travel, tourism and recreational services while 11 per cent to 16 per cent contraction is arrtibuted by the trade shock. The oil price shock has trivial but positive effect on Bangladesh economy.

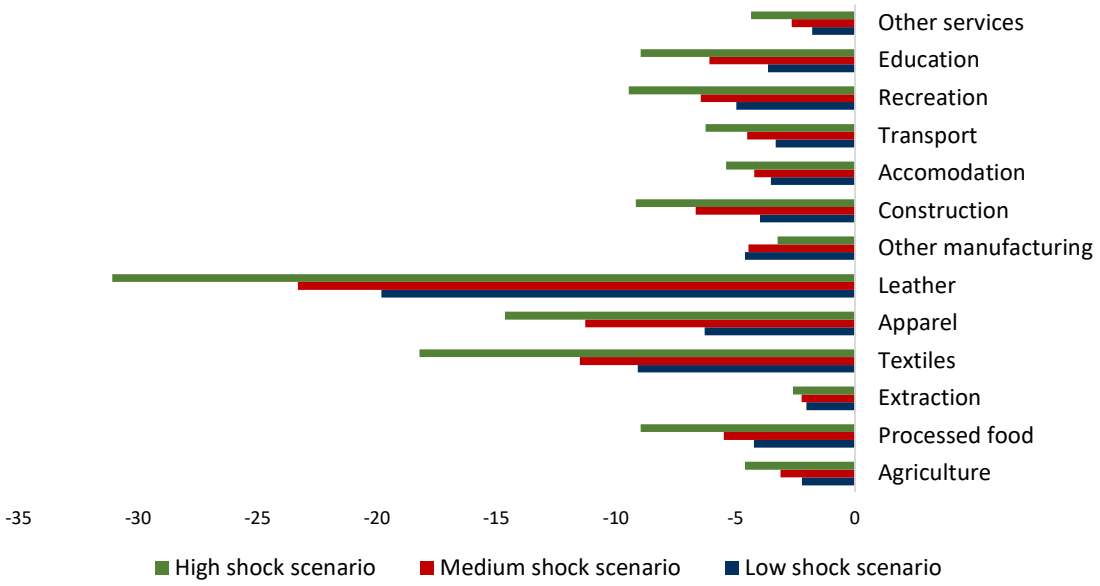
Figure 13: Contribution of different channels in overall GDP contraction in Bangladesh



Source: Authors' simulations

The implications for the aggregate output or GDP can be captured through changes in sectoral outputs. This is provided for Bangladesh in Figure 14. It is found that the leather sector is likely to be hit hardest with the sector's output declining between 20 and 31 per cent from the pre-Covid baseline. It will be followed by textile (6% - 15% decline in output) and apparel sectors (9% - 18% decline). The contraction in the agriculture sector – in the range 2.2 per cent – 4.6 per cent – would be lower than many other sectors. When disaggregated further, as shown in annex Table A2, within agriculture, the impact is much lower for crop agriculture than non-crop (i.e. livestock, fishing and forestry) production.

Figure 14: Impact on sectoral GDP (%)

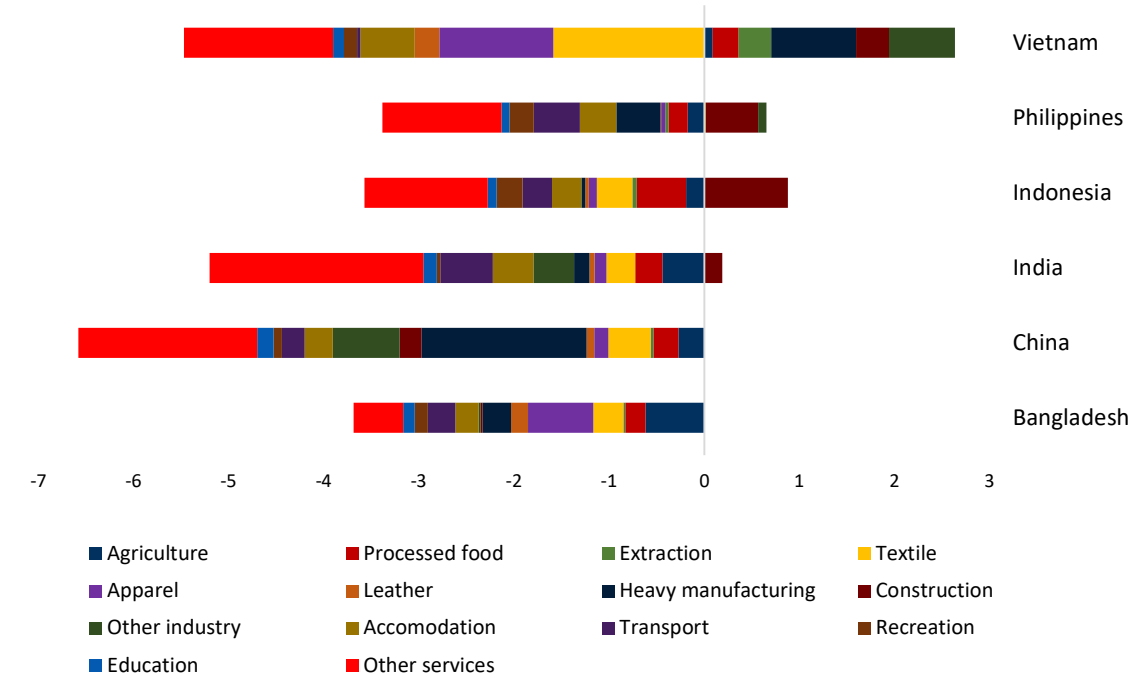


Source: Authors' simulations.

Changes in sector-specific outputs can be used to attribute the overall growth contraction due to various sectors.This is summarised in Figures 15, 16 and 17 for low, medium, and high scenarios, respectively for some selected countries. Under the low shock scenario, of the 3.7 per cent reduction in Bangladesh's GDP, apparel sector accounts for 0.7 per cent. It is followed by agriculture and other services which contribute to respectively 0.62 per cent and 0.52 per cent contraction in GDP. Under medium shock scenario, of the oveall 6.2 per cent reduction in GDP, agriculture (includng crop and non-crop), apparel and other services contibute around 1 per cent each.[4] In the case of high shock scenario, as the GDP contract by 9.27 per cent from the baseline, the largest 1.93 per cent will be attributed to by other services only, followed by agriculture (1.66 per cent) and apparels (1.4 per cent). As shown in figures 15 – 17, Bangladesh does not have any sectors that post postive growth,[5] and for India, Indonesia and the Philippines as well, sectors with incresed outputs are negligible. Vietnam appears to be an exceptional case where several sectors are registering postive growth. It has been able to contain the spread of Covid-19 successfully to sustain domestic economic activites while the disruptions mainly came from the reduced demand for its exports. However, because of its heavy dependence on the export sectors, – as its export-GDP ratio is higher than 100 per cent, which is the highest amongst the large countries – the growth in certain largely domestic market-oriented sectors could not outweight the effect of redcued demand for exports. As Figure 10 shows, the contraction in textile and apparel sectors, which have a very high export-orientation, contributes to 3.35 per cent decline in overall GDP of Vietnam under medium shock scenario.

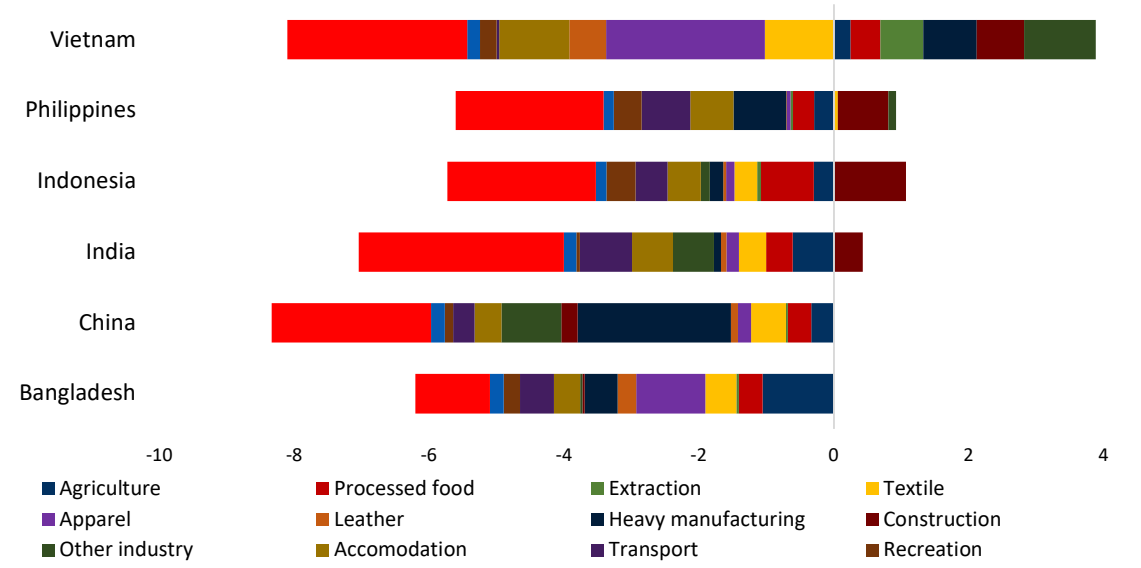
[4] Other services include utility, communications, insurance and financial services, health, trade, warehousing and support activities, real estate activities, business services, public administration and defense, and dwellings.
[5] The extractive sector show some growth as shown in Annex Table A2. However, the contribution of this sector to GDP growth is negligible.

Figure 15: Low shock scenario: sectoral contribution to GDP contraction (%)



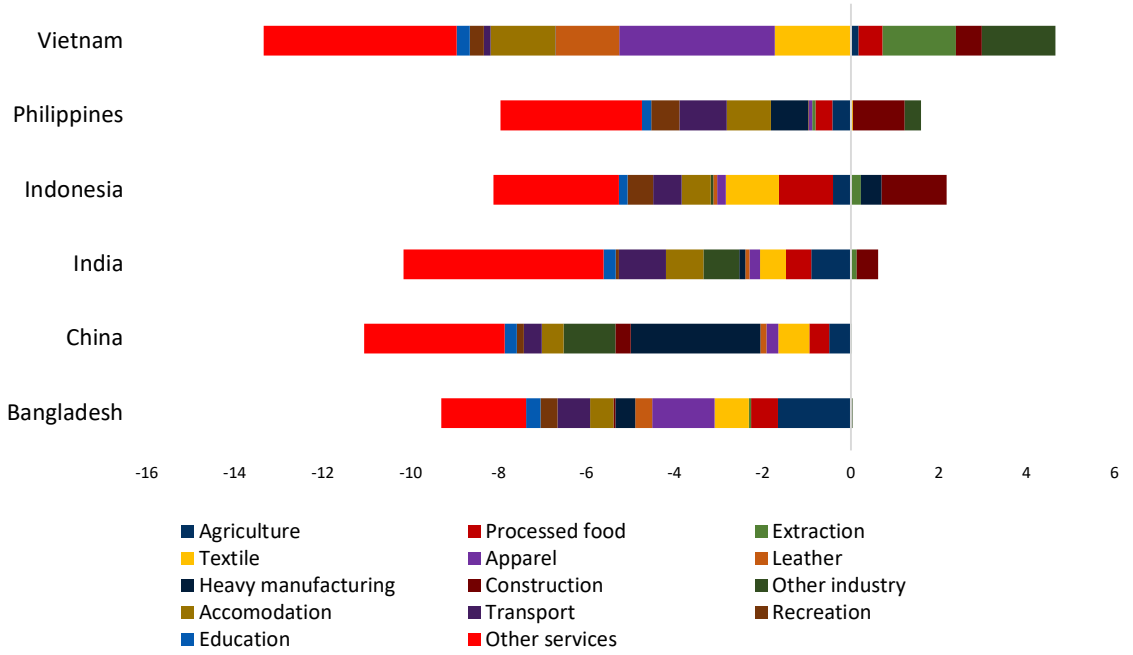
Source: Authors' simulations

Figure 16: Medium shock scenario: Sectoral contribution to GDP contraction (%)



Source: Authors' simulations

Figure 17: High shock scenario: Sectoral contribution to GDP contraction (%)

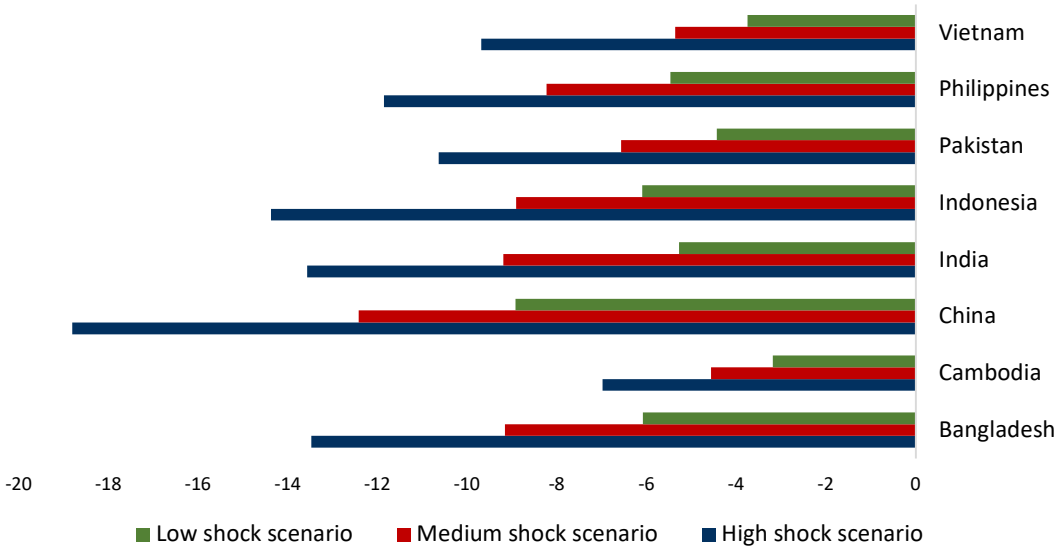


Source: Authors' simulations

Even prior to Covid-19, Bangladesh's exports were under pressure as export earnings during July 2019 and February 2020 declined by 4.8 per cent. This was largely attributable to an unfavourable global trading environment emanating from the U.S.-China trade war leading to heightened policy uncertainty for global traders and investors. The Covid-19 pandemic then made the situation worse with reduced cross-border trade, a drastic decline in international tourism activities, and an overall global economic slowdown as countries imposed economic shutdown measures to contain the disease.

Simulations from the modeling exercise seem to suggest Bangladesh's overall trade volume to decline by 6.1 per cent, 9 per cent and about 14 per cent, respectively under the low, medium and high scenarios. Amongst comparators, impacts for China are much larger but for India, Indonesia and the Philippines (Figure 18), the shocks are largely comparable.

Figure 18: Impact on trade (%)



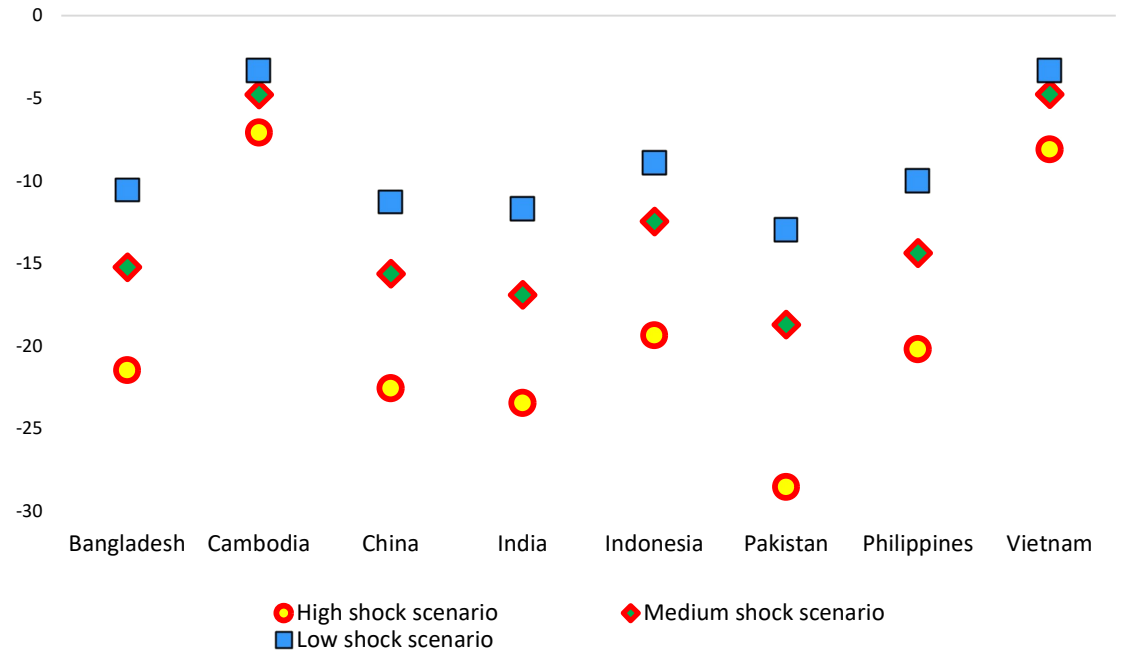
Source: Authors' simulations

Under the low shock scenario, Bangladesh's exports are found to decline by $4.6 billion, which rises to $9.4 billion under the high shock scenario (i.e. a decline in the range 10.6% - 21.5% per cent from the baseline in the absence of Covid-19) (Figure 19). The loss in exports in percentage terms is comparable with China, India, Indonesia and Pakistan. Cambodia and Vietnam, on the other hand, are simulated to have a lower contraction in their respective exports.[6] Needless to mention that, apparel items for Bangladesh will experience the largest absolute export contraction (estimated to be in the range 8 – 15% apparel exports baseline). In terms of percentage changes from the baseline, exports of taxtile products could decline by 34.5 per cent to 58 per cent, while the corresponding change in leather and leather goods exports would be 28 per cent to 56.3 per cent under low to high shock scenarios (Figure 20). Services exports, which is less than 10 per cent of Bangladesh's total exports, are found to contract by 10-11 per cent.

Bangladesh's overall imports are simulated to decline by 3 per cent to 8 per cent from the baseline (Figure 21). The comparable contractions are in the range of 6-14 per cent in China, 2.2 -5.7 per cent in India, 3.2-9.3 per cent in Indonesia, 2.6-6.5 per cent in the Philippines, 4.1-11 per cent in Vietnam.

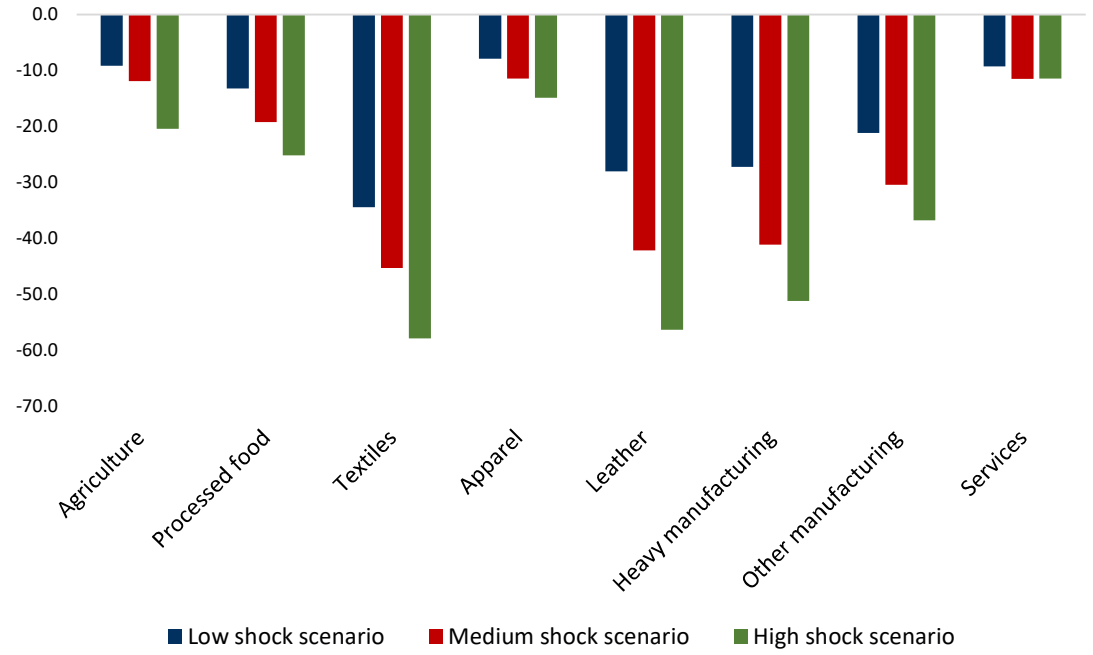
[6] However, in absolute terms, the impact on Vietnam would be much higher than that of Bangladesh as the former has a much bigger export volume.

Figure 19: Impact on exports (% of contraction)



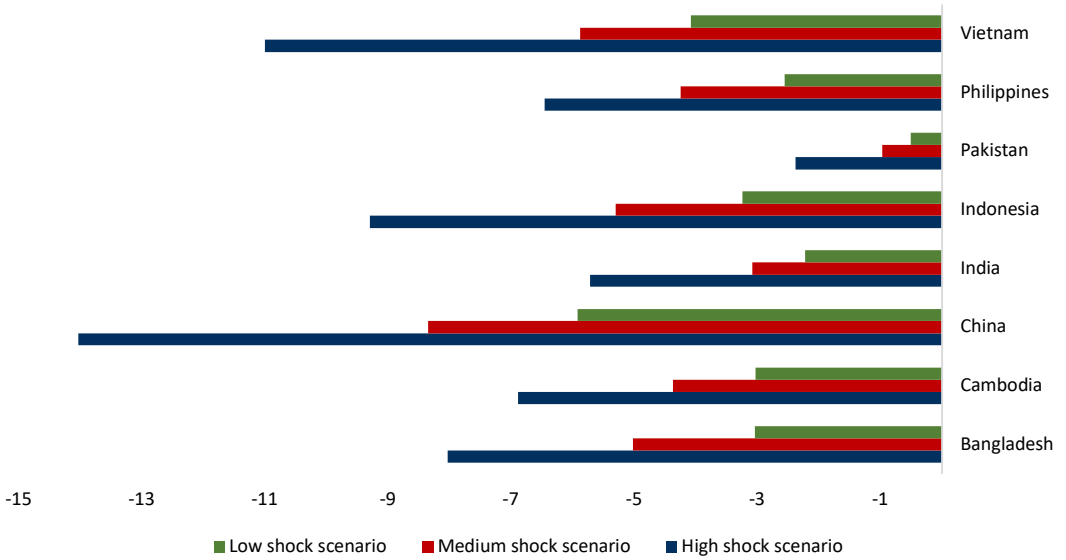
Source: Authors' simulations.

Figure 20: Impact on exports by sector (%)



Source: Authors' simulations.

Figure 21: Impact on overall imports (% deviation from the baseline)

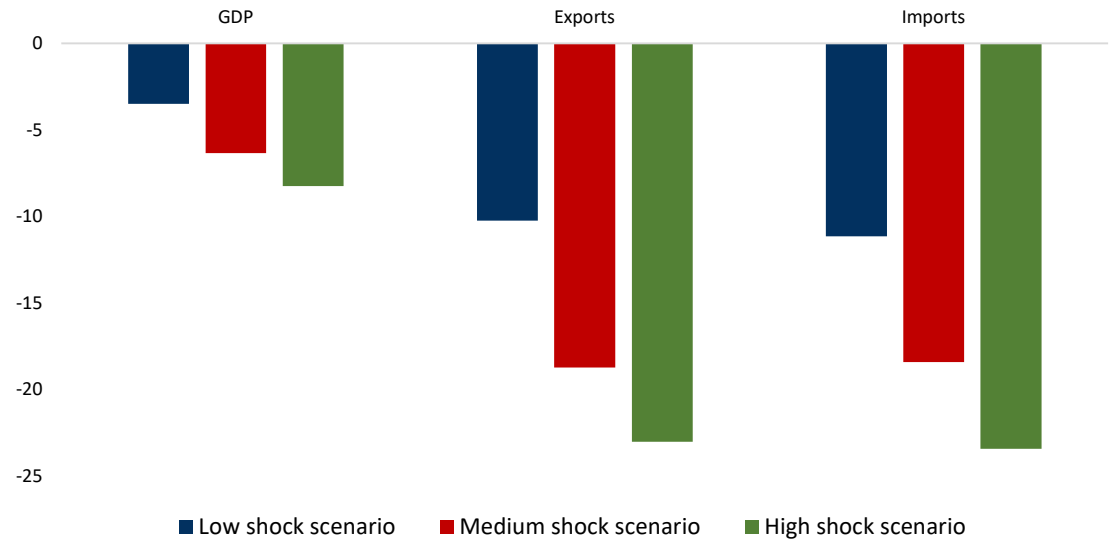


Source: Authors' simulations.

4.2 Results from the Bangladesh-focused Modeling Approach

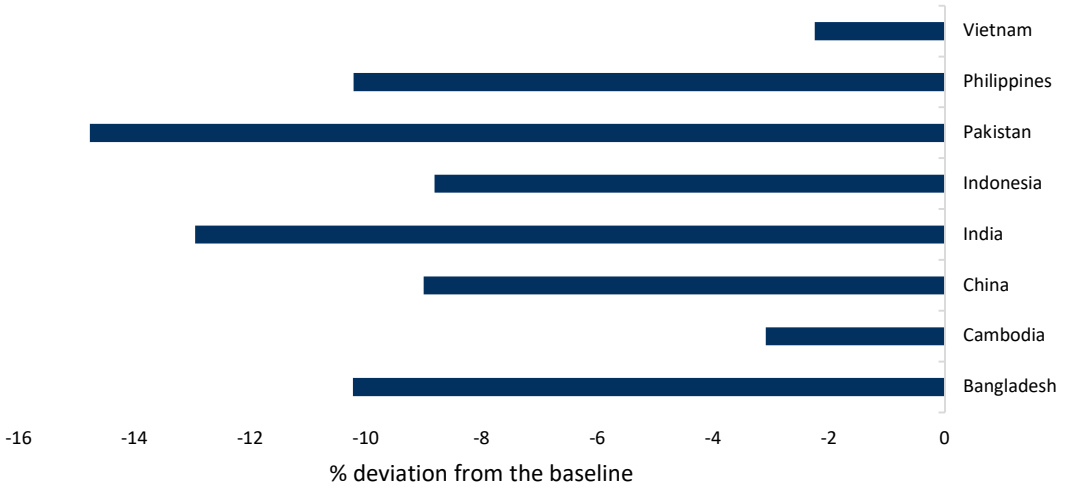
The simulation results using the Bangladesh-focusedmodeling exercise provide the impacts on GDP and exports that are comparable with the results reported using the the modelling of individual economies. Bangladesh's GDP is simulated to fall short of the baseline value by 3.5 per cent under the low shock scenario (Figure 22). In value terms, it is equivalent to $10.5 billion but rises to $19.1 billion and $24.8 billion (equivalent to 6.3% and 8.2%) respectively under medium and high scenarios. Overall, goods and sercices imports could shrink by $7.2 billion to $15.1 billion (equivalent to 11.1%-23.4% decline in comparison with the baseline imports). Exports, on the other hand, could fall by 10.3 per cent or equivalent of $4.5 billion under the low shock scenario (in comparison with the baseline exports). This could increase to 18.7 per cent and 23 per cent (equivalent of $8.2 and $10.1 billion) under medium and high shock scenarios. In the Bangladesh-focused model, under low shock scenario, the corresponding impact on exports will be a 9 per cent in China, 12.9 per cent in India, 14.8 per cent in Pakistan and 2.3 per cent in vietnam (Figure 23).

Figure 22: An alternative simulaiton on the impact of Covid-19 in Bangladesh



Source: Authors' simulations.

Figure 23: Export contraction under low shock scenario



Source: Authors' simulations.

Figure 24 presents the impact on sectoral output by a few selected sectors estimated from the Bangladesh-focused modelling exercise. It is found that the apparel output would shrink in the range 9 per cent – 22 per cent depending on the shock scenarios. The corresponding contraction in leather would be 10.4 per cent to 25.7 per cent. Recreation and related services output falls 3.25 per cent to 7.2 per cent of the baseline, while other services also show an even bigger contraction in the range of 5.7 per cent to 15.3 per cent. The shock on agriculture sector will be relatively lower.

The impact by sectoral exports in the Bangladesh-focused model are also largely comparable with the results obtained earlier from the global modeling approach. As shown in Figure 25, apparel exports are to fall by 8-19 per cent while the corresponding decline for textile products turn out to be much higher at 40 per cent. Leather and leather goods see contraction in the range 23-50 per cent under the three different scenarios. Under the low shock scenario, exports of agricultural products fall by around 3 per cent, which increases to about 13 per cent under the high shock scenario.

Figure 24: Sectoral output shock from Bangladesh focused model for selected sectors (per cent deviation from the baseline)

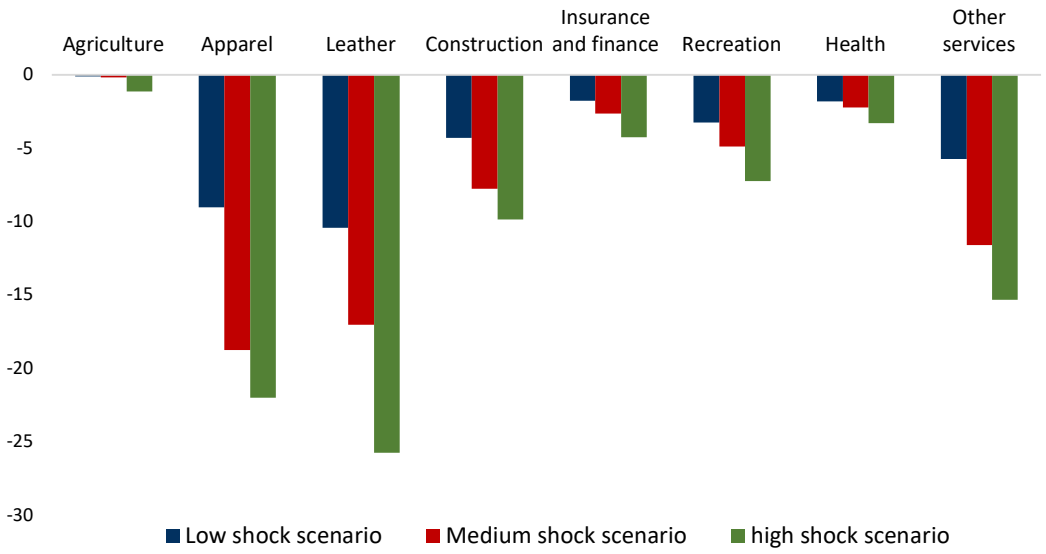
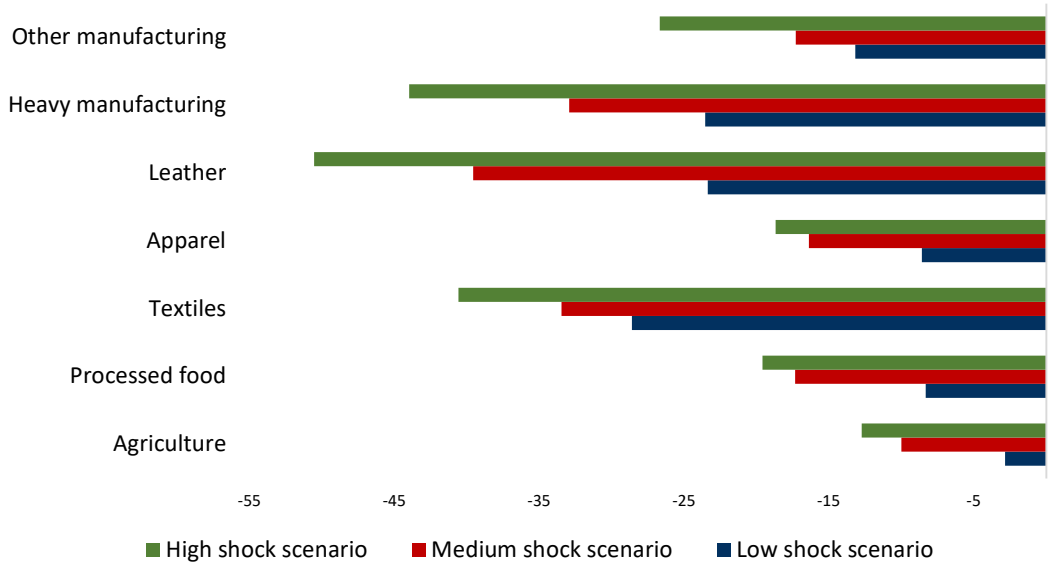


Figure 25: Changes in sectoral exports from the Bangaldesh-focused model



Source: Authors' simulations.

V. Policy Implications

Impact on household income

The Covid-19 global pandemic impacted incomes of almost all different types of households. Several micro studies and surveys revealed that incomes of poor and vulnerable population groups had drastically fallen particularly when the economic shutdown measures were imposed. Informal sector workers e.g. restaurant workers, rickshaw pullers, day labourers, artisans, domestic helpers, agricultural labourers, petty business owners, shopkeepers, saloon/parlour workers, etc. have been affected severely. Even after the withdrawal of economic shutdown measures, economic activities remained somewhat subdued having a prolonged impact on household incomes. As discussed earlier, the available micro studies did not aim to be nationally representative. Therefore, deriving impact from these sources alone can be problematic. Furthermore, it is also important to note that some of the shocks could be purely temporary or transitory in nature. As the economy bounces back, some of the lost income could be recouped. The issue of time horizon in discussing policy implications is also important. The modelling results presented above use a comparative static framework reflecting adjustments taking place over a short to medium term. Without the need for considering whether one is measuring the immediate impact of lockdown or the recovery period, one approach could be to think about a time horizon within which any of the three scenarios designed earlier could be realised. Therefore, one key policy issue is to find out the poverty impact associated with the simulation scenarios.

An attempt is thus made to assess the income implications arising different shock scenarios for various household categories. In the GTAP framework there is just one representative household, which cannot provide further insights into poverty and/or distributional consequences. To overcome this problem, the results from the GTAP model are incorporated into the Social Accounting Matrix (SAM) of Bangladesh, and then the SAM-based multiplier method is utilized to study the impact at the household level.[7] The 2020 SAM used here was developed as part of the 8th Five Year Plan background work by the General Economic Division (GED) of the Planning Commission. The Bangladesh SAM has classified eight broad household types and provides transactions involving 23 sectors. There is an exogenous account in the model which includes government income/expenditure, exports, imports, remittances, foreign investment, etc.[8] For the present exercise, arbitrary shocks using trial and error

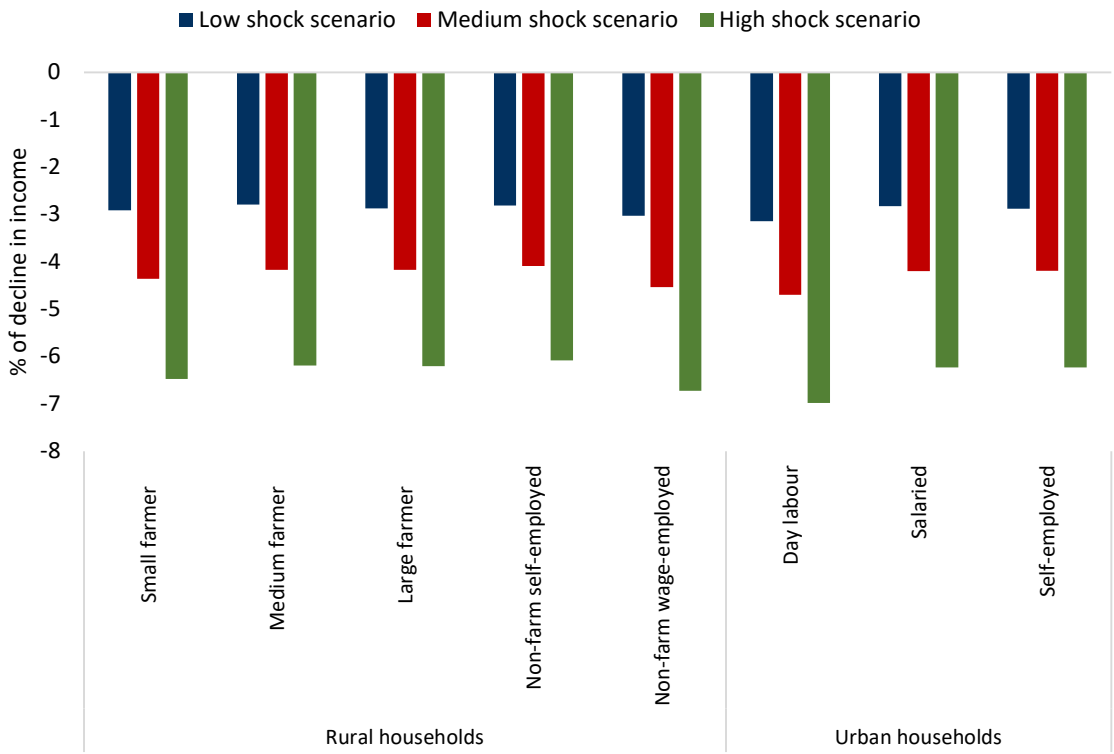
[7] A SAM shows the interdependence between commodities and activities with respect to production and price formation; captures the relationship between factors and activities in primary income generation; depicts the association between the factorial and institution income distribution; and shows the relationship between commodity supply and institutional consumption. It also captures the equality between the total of expenditure and income accounts of all accounts representing behaviour of commodities, activities and institutions. The SAM offers a data consistent macroeconomic framework.

[8] A SAM multiplier framework requires decomposing the SAM accounts into 'exogenous' and 'endogenous'. Generally, the accounts intended for use as policy instruments (e.g. government expenditures, investment, exports, etc.) are made exogenous, and the accounts specified as objectives or targets must be made endogenous (e.g. output, commodity demanded, factor returns and household incomes or expenditures, etc.). For any given injection/shock into the exogenous accounts, the influence is transmitted through the interdependent SAM system to endogenous accounts. The interwoven nature of the system implies that factor incomes, household incomes and production are all derived from exogenous injections into the economy via a multiplier process.

methods have been employed in the SAM model to depict sector-specific output shocks that are comparable to those obtained in GTAP simulations.

The results of the SAM multiplier model seem to suggest that disruptions in sectoral outputs lead to falling consumption spending of various households by 2.8 per cent, 4.2 per cent, 6.2 per cent under the low, medium, and high shock scenarios (Figure 26). Under each of the shock scenarios, the variation in income loss appears to be low across different types of households. This might be due to the inherent structure of the SAM model.

Figure 26: Impact of Covid-19 shocks on household consumption expenditure



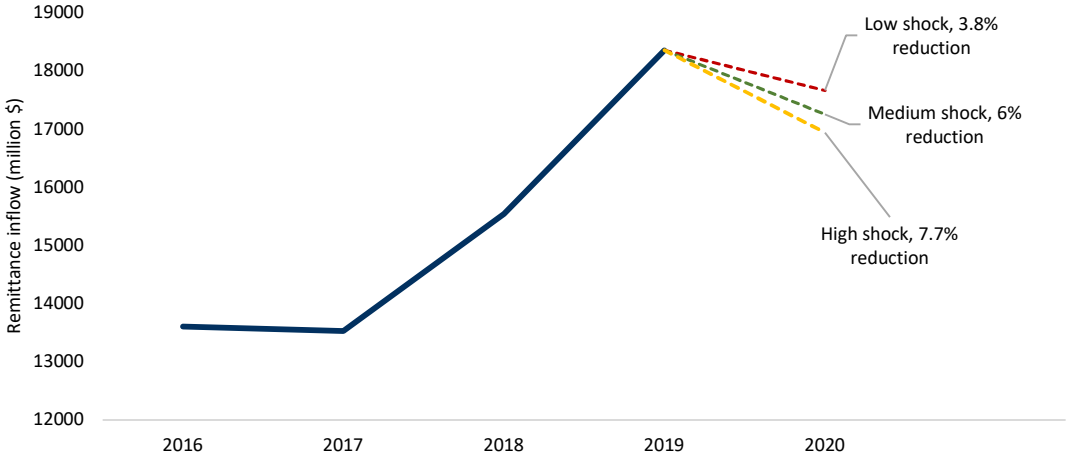
Source: Source: Authors' simulations.

Another important issue that has received a lot of attention is the impact of remittances. Since the outbreak of Covid-19, there has been an apprehension about falling remittances. After the initial weakness during March – May 2020, remittance flows have remained resilent although global projection exercises (e.g. World Bank 2020b) continue to suggest unfavourable prospects. The modelling framework used in this paper allows assessing the impact of any downturn in remittances. Remittances sent by the migrant workers are an important channel through which the impact of Covid-19 is transmitted ito the household level. It is estiamted that 7.8 million Bangladeshi migrant workers are working in different countries (UN DESA, 2019). The main concentration of these workers are in Middle Eastern countries along with Malaysia and Singapore. The global pandemic has already led to curtailment of economic activities in these labour-importing countries, affecting employment. As mentioned earlier, all oil-exporting countries had seen oil prices collapsing causing depressed economic activities and reduced demand for migrant labour.

In order to simulate the potential impact of Covid-19 on remittance inflow in Bangladesh, we utilised the GTAP bilateral Labor migration (GMig2) Model and database. One salinet feature of this database is that unlike the GTAP database it incoporates bilateral labour flows involving the regions/countries in the model. The regional and sectoral aggregations used in Gmig smulations are the same as described above.

According to Takenaka et al. (2020), the shock from Covid-19 to remittances is transmitted through: i) the decline in GDP growth of all countries (source and host) which affects the wage differential and the employment status of labour between source and host countries; ii) shutdown of economic activities which leads to widespread job losses, including foreign workers in host economies; and iii) the fall in the demand for, and prices of oil, which affects oil sector production. These are captured in our Bangladesh-focused model. Therefore, any potential fall in remittacnes is simulated considering the same set of shocks as used in the Bangladesh-focused model. The impact on overall remittance inflow into Bangladesh is simulated to be 3.8 per cent, 6 per cent and 7.7 per cent lower than the baseline values under the low, medium and high shock scenarios, respectively (Figure 27). This translates into any yearly fall in remittances of $700 million to $1.4 billion.

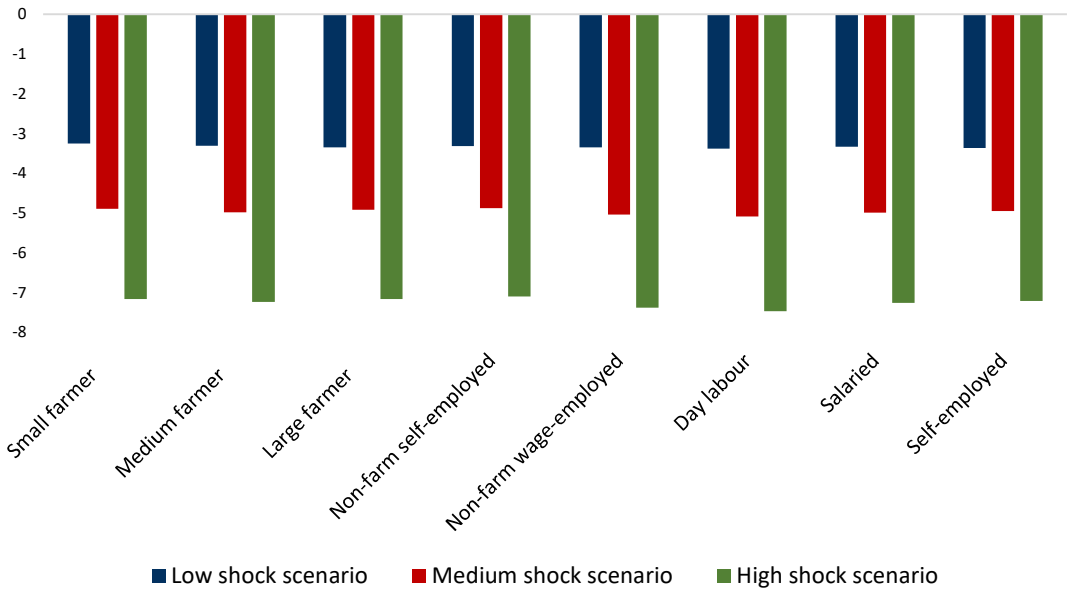
Figure 27: Impact on remittance inflow in Bangladesh



Source: Authors' simulations based on Gmig2 model.

The decline in remittance have critical implications on households' income and spending in Bangladesh. The SAM simulation suggest that when falling remittances are added with the disruptions in sectoral outputs, the adverse impact on household consumption spending increases from 6.2 per cent to 7.5 per cent under the high shock scenario. This also leads to a fall in household spending by 3.5 per cent and 5.7 per cent under low and medium shock scenarios. The corresponding figure were 2.8 per cent and 4.2 per cent respectively, when declining remittance was not included (as discussed above).

Figure 28: Impact of COVID-19 on household income



Source: Authors' simulations form the SAM model.

Poverty Impact

The loss in household income and consumption have substantial implications for poverty outcomes. The household income loss obtained from the SAM multiplier model has been introduced in the Household Income and Expenditure Survey (HIES) 2016 data to estimate the impact on poverty. It is estimated that Covid-19 – under the low shock scenario – could push up the proportion of the population living in poverty up to 22.7 per cent from the immediate pre-Covid rate of 20.5 per cent. The corresponding figures could be 24 per cent and 25.7 per cent under medium and high shock scenarios, respectively. There are significant variations across the household categories with the impact being highest for small farmers and non-farm wage employee households in rural areas and day labourers in urban areas. The comparable impact from Covid-19 is relatively low for large farmers and non-firm self-employed households in rural areas and salaried employees and self-employed households in urban areas.

Table : Impact of Covid-19 on headcount poverty by types of household (% of population living below the poverty line)

	Pre-Covid baseline	Low-shock scenario	Medium-shock scenario	High-shock scenario
Rural households				
Small farmer	36.4	39.9	41.6	43.9
Medium farmer	17.9	20.4	21.6	23.6
Large farmer	11.8	13.8	14.5	17.4
Non-farm self-employed	16.5	18.8	19.9	21.3
Non-farm wage-employed	23.3	25.7	27.6	29.8
Urban households				
Day labour	29.1	31.6	32.9	35.2
Salaried	11.2	12.5	13.2	14.6

Self-employed	10.8	12.1	12.7	13.3
Overall	20.5	22.7	24.0	25.7

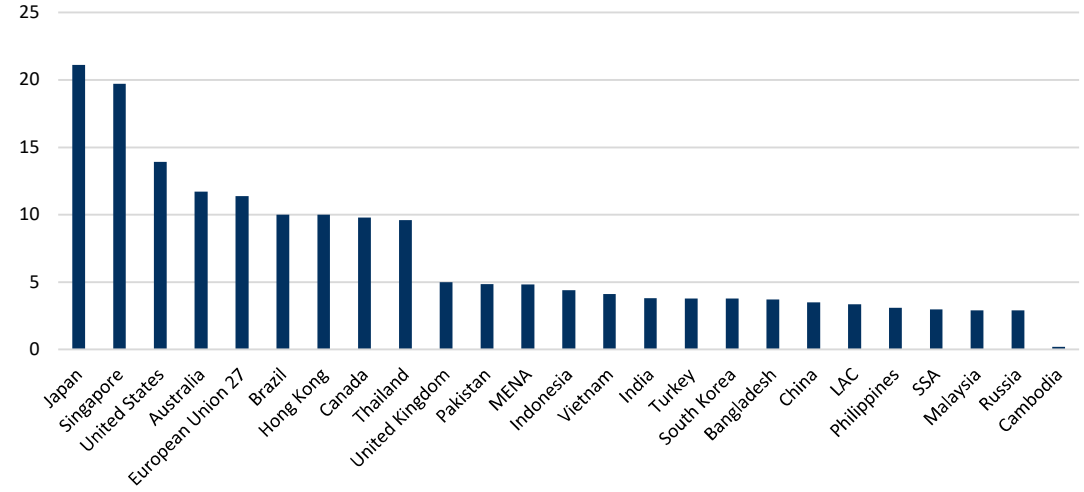
Note: Small farmers also incorporate day labourers working in the rural agriculture sector.
Source: Authors' estimation.

The simulated poverty impacts are 2.2 – 5.2 percentage points higher than the pre-Covid situation. These appear to be much lower than other projections mentioned earleir. This is because the simulaiton results have bene dervided from a data consistent macroeconomic framework. The low-shock scenario analysed here depicts a possibility of GDP deviating (falling) by around 3.5 percentage points from an anticipated (baseline) growth of 8 per cent. That is, the low-shock scenario would still reflect a modest growth with which one should not expect severe deterioration in poverty. On the other hand, the impact of the high shock scenario portrays a case when no growth would be registered in the economy, in which case the disruptions cause poverty incidence to rise by just above 5 percentage points. These are therefore more plausbile possibilities than considering that the economy is growing at a rate of 5 per cent and poverty incidence to rise by 10 percentage points. It is worth pointing out that the analysis has considered only the poverty headcount incidence. Estimation of poverty gap ratio would likely to show greater poverty impact due to Covid-19 related disruptions.

Effects of the government policy response

After the outbreak of Covid-19, governments across the world announced fiscal stimulus and economic stabilization packages to contain the economic fallouts. These stimulus packages are spread over, but not limiter to, cash or in-kind transfers to poor and vulnerables, wages support to firms to retain workers, transfers to small enterprises, subsidised loans for small, medium and large enterprises, unemployment benefits, and support for returnee migrant workers, etc. Likewise, the government of Bangladesh announced a Tk. 1,03,117 crore stimulus package – equivalent to 3.7 per cent of GDP – comprising 19 initiatives/programmes. The sizes of the stimulus packages vary widely: 21 per cent of GDP in Japan, 19.7 per cent in Singapore, 13.9 per cent in the United States, 4.1 per cent in Vietnam, 3.8 per cent in India, and 3.5 per cent in China, amongst others (Figure 29).

Figure 29: Fiscal stimulus package as per cent of GDP



Note: Information is as of August 2020.
Source: Authors' compilation.

The policy support measures in Bangladesh are targeted mostly towards the economic recovery process, providing working capital and other incentives to large firms, and cottage, medium and small medium enterprises (CMSME), export promotional activities, providing export-oriented firms subsidized loans to pay wages and salaries to their workers and employees, import facilitation, and dispensing assistance to the agriculture sector and farms to promote agricultural productivity and ensuring food security (Razzaque, 2020).

Table 5: Major programmes under the stimulus package in Bangladesh

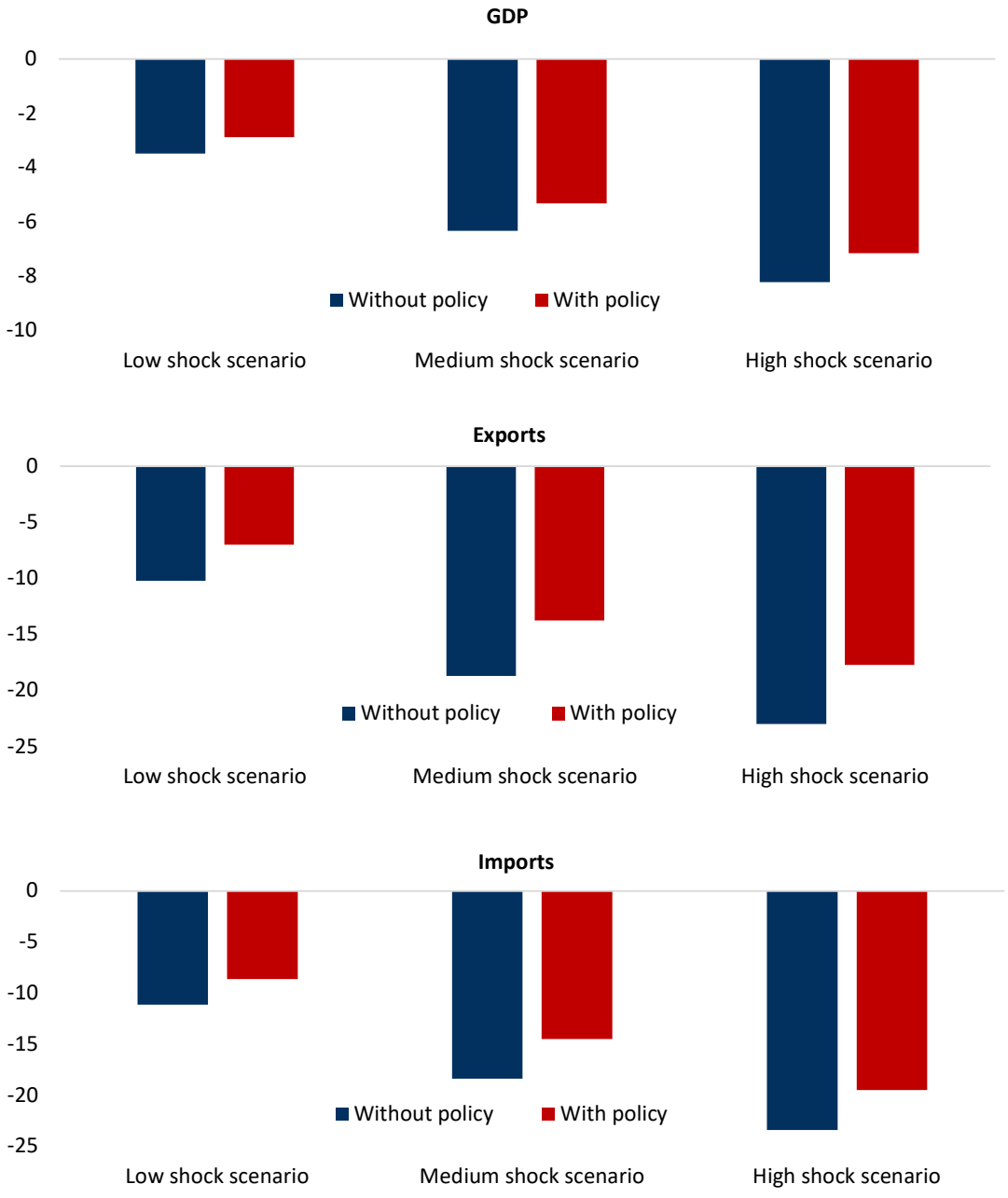
SL	Programme	Allocation (BDT in Crore)	Source of fund	Purpose	Disbursement type	Charge for credit or interest payment	Project duration
1	Export Oriented Industries (wage and salaries)	5000	Govt. revenue	In order to pay wage and salaries to workers and employees	Soft loan	2% service charge with 6 months grace period	2 years
2	Large industry and service sector firms/institutions	30,000	Funds owned by the scheduled banks	To provide working capital for heavy industries and service sector to run business and continue production	Soft loan	Borrower 4.5%+ Government 4.5% Total 9%	3 years
3	Cottage, medium and small medium enterprises (CMSME)	20,000	Funds owned by the scheduled banks	To provide working capital loan facilities to cottage, medium and small medium enterprises (CMSME)	Soft loan	Borrower 4% + government subsidize 5 % total 9%	3 years
4	Export Development fund	12,750	Foreign reserve	To facilitate import of raw materials under back-to-back letters of credit (LC)	Soft loan	2% per annum	Ongoing
5	Pre-Shipment Credit Refinance Scheme	5000	Funds owned by Bangladesh Bank	To facilitate export manufacturing goods	Soft loan	BB will charge interest 3% from banks and banks will charge 6% from customers. (7% int rate)	3 year
6	Honorarium for doctors, nurses, and health-workers	100	Govt. revenue	To pay (the personnel working closely with covid-19 patients) an honorarium equivalent of two months' basic salary.	Cash allowance/honorarium	-	-
7	Health and life insurance	750	Govt. revenue	To pay the (according to the rank in job) associated personnel in case they infected by and/or die from covid-19 while on duty.	Insurance facility	-	-
8	Procurement and distribution of rice and wheat	2,503	Govt. revenue	To distribute 5 lakh metric tons of rice and 1 lakh metric tons of wheat free-of-cost among the low-income people	Food items	-	-
9	Special Open Market Sales (OMS)	251	Govt. revenue	To introduce a special Open Market Sales (OMS) in which 74 thousand metric tons of rice will be sold at BDT 10 per kg to low-income people living in urban areas	Food items	-	-
10	Vulnerable Families	1,250	Govt. revenue	To provide cash assistance of TK 2,500 to each of 50 lakh poor families impacted by the Covid-19 crisis.	Cash transfer	-	One-off

11	Expanding "Old Age Allowance" and "Allowances for the Widow, Deserted and Destitute Women"	815	Govt. revenue	To expand the existing Old Age Allowance and Allowances for the Widow, Deserted and Destitute Women schemes under the social safety net system in 100 poverty-prone upazilas	Cash transfer	-	-
12	House construction for the homeless people	2130	Govt. revenue	To build houses for the homeless people as a part of celebration of Mujib Centenary	House construction	-	-
13	Paddy purchase	860	Govt. revenue	To directly collect paddy and rice from the farmers during the Boro-Irri season (extra 2 lakhs MT)	Paddy/rice purchase at fair price	-	-
14	Farm mechanization in agriculture	200	Govt. revenue	To facilitate the purchase of agricultural equipment/ machinery by the farmers.	Technical support	-	-
15	Agricultural Subsidy	9,500	Govt. revenue	To provide subsidies to the agriculture sector, especially to assist the farmers in buying fertilizers at lower prices.	Subsidy	-	-
16	Agriculture refinance scheme	5000	Funds owned by Bangladesh Bank	to provide required agricultural credit to small and medium farmers, including that of poultry and dairy sector, in rural areas	Soft loan and micro-credit	BB will charge interest 1% from banks and banks will charge 4% from customers	1.5 years
17	Low income professional, farmer, extreme-small business	3000	Funds owned by Bangladesh Bank	To support low income professional, farmer, ultra-small business	Soft loan and micro-credit	BB will charge 1% interest to banks, banks will charge 3.5% interest to Micro Credit Financing Institutions (MCFIs) and MCFIs will charge 9% interest to customer.	2 years
18	Work Creation Drive	2,000	Govt. Revenue	To disburse loans (through Pallisanchay Bank, Karmasangsthan Bank, Probashi Kollyan Bank and PKSF) on low-interest among the expatriate migrant workers, educated-unemployed youth for self-employment.	Soft loan and micro-credit	-	-
19	Subsidy against the interest of bank loan for April-May/2020	2000	Govt. Revenue	To provide credit support to the borrowers so that they need not to repay the interest which they took from the banks for doing businesses.	Interest subsidy	-	-

Source: Author's compilation from various documents of the Government of Bangladesh.

When the stimulus packages are incorporated into the model, the simulations results show the adverse impact of Covid-19 on the economy to fall to 2.9 per cent to 7.2 per cent of GDP under the three alternative shock scenarios (Figure 30). That is, because of the government policy measures the impact on overall GDP would be 0.6 percentage points lower under the low-shock case and under both medium and high shock cases the impact would be around 1 percentage point lower. On exports, the impact of stimulus package is between 3 and 5 percentage points while for imports the comparable impacts are in the range 2.5 per cent – 3.9 per cent.

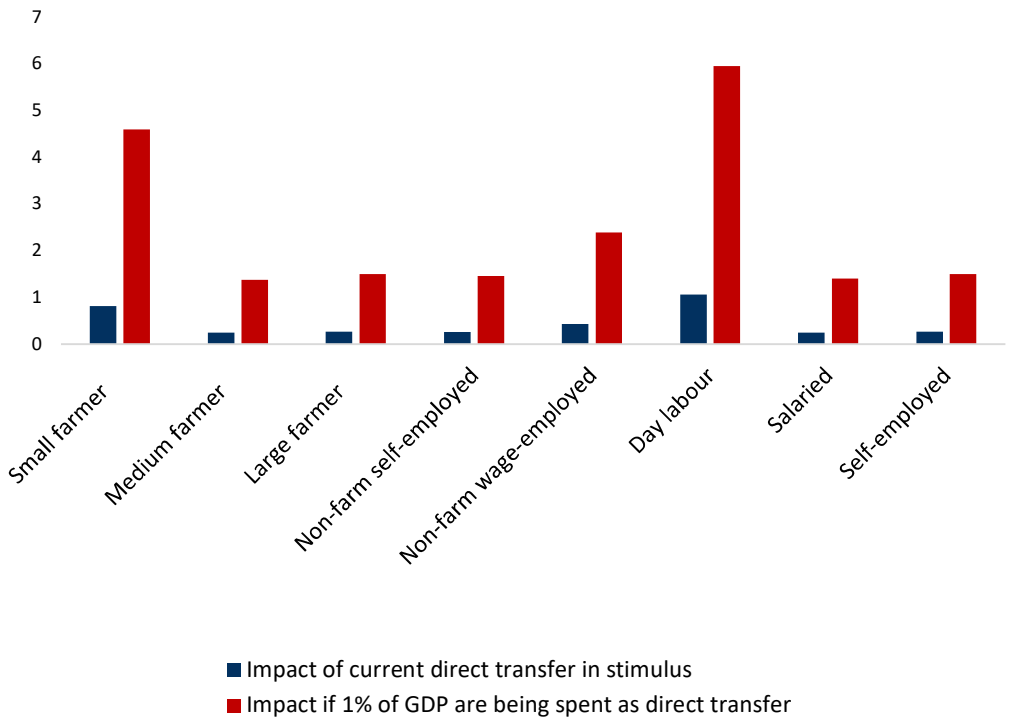
Figure 30: Impact of Covid-19 on GDP, exports and imports with and without the stimulus package (% deviation from the baseline)



Source: Authors' simulations.

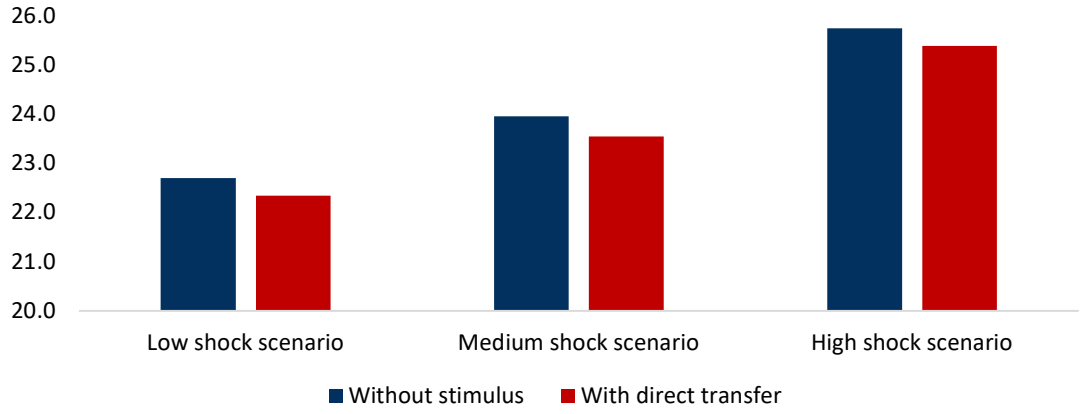
Government policy response can stimulate economic activities, countering the adverse implications for household income and consumption. More specifically, direct transfer (cash and in-kind) can help stabilise consumption for low-income households contributing to addressing poverty and vulnerability arising from the pandamic-induced consequences. In the stimulus pacgkage, there is an alloction of Tk. 4,819 crore for providing a one-off transfer to vulnerable households and for expanding social security programmes including old-age allowance, support for the widow, deserted and destitute women, open market sale of rice and wheat at subsidised prices. The multiplier effects of this direct transfer obtained from the SAM-based moder can offset half a-percentage point reduction in overall household income with slightly higher impacts of about 0.8 percentage points and 1.05 percentage percentage points for small farmers and day labourer, respectively (Figure 31). This, in turn, can reduce the headcount poverty incidence by 0.4 percentage points under the low-shock scenario (Figure 32). The poverty impact of the stimulus is low due to the relatively small size of direct transfers. Increasing such transfers to households can substentially contribute to poverty reduction. It is estimated that Bangladesh can restore the pre-covid baseline poverty rate of 20.5 per cent under the low shock scenario by spending only one per cent of GDP as direct cash transfer to low income households, in addition to the current social security spending. The multiplier effect of this transfer amount can outweigh 4.5 and 6 percentage points decline in income for small farmers and day labourers, respectively. This can help post-Covid headcount poverty to fall by more than 2 percentage points under medium and high shock scenarios.

Figure 31: Impact of direct transfer on household income (% of income)



Source: Authors' simulation based on SAM 2020 of Bangladesh.

Figure 32: Impact of direct household transfer on poverty reduction



Source: Authors' estimation.

VI. Concluding remarks

The Covid-19 global pandemic is causing widespread disruptions for global economies including Bangladesh, affecting domestic economic activities; earnings of households and firms; employment; and international trade (exports and imports), remittance, and investment flows. In the absence of a vaccine or effective treatment, governments worldwide implemented large-scale containment and economic shutdown measures. These actions have resulted in unprecedented short-term economic losses. After the withdrawal of lockdown measures, economic activities are gradually resuming although it is not clear when a full-swing recovery will be possible. Overall, for an overwhelming majority of countries, economic activities will remain subdued.

This study has highlighted that assessing impact of Covid-19 has also been challenging because of lack of suitable data. Furthermore, in the absence of a data consistent macroeconomic framework, various projections and estimates of economic growth and poverty incidence become incompatible, making it difficult to deduce meaningful policy implications.

While several analyses and micro surveys in Bangladesh have highlighted the immediate impact of lockdown on income and poverty situations of poor and vulnerable households, this paper considers an ex ante macroeconomic approach in assessing the implications for 2020 against a baseline without any Covid-19 related disruptions. Rather than focussing on just one possibility, it realistically builds various likely scenarios to simulate impacts. While the GTAP modelling framework has been used for studying the shock scenarios, a SAM multiplier model for Bangladesh has also been utilised to analyse income and poverty impact at the household level and deriving further policy implications.

The results show that Covid-19 shocks cause output shortfalls in the range 3.5–9.3 per cent as against the baseline of the Bangladesh economy portraying an 8 per cent GDP growth. Exports are simulated to fall by around 10 per cent under the low shock scenario and 23 per cent under a high shock scenario. These disruptions are reflected into reduced outputs of various sectors with leather, textile and apparel sectors are picking up largest declines in production in terms of percentage of respective baseline outputs. Processed food, construction and various services sector also experience

considerable decline. Simulations from a global migration model show the remittance inflow into Bangladesh to shrink by 3.8 – 7.7 per cent.

Loss of outputs of different sectors are linked to factor incomes and household consumption. Simulations from a social accounting matrix multiplier model suggest that sectoral output changes to cause household consumption spending to decline by 2.8–7 per cent. If the earlier simulated likely weaknesses in remittances are added to this, the corresponding household consumption decline further to reach 3.5–7.5 per cent. This results in the rising poverty incidence by 2.2–5.3 percentage points depending on alternative shock scenarios. For the three poverty-prone households of small farmer, daily labourer, and non-farm wage-employed households the average proportion of households in poverty rises by 3.5, 2.5 and 2.4 percentage points due to Covid-19 under the low-shock scenario. The corresponding figures could be as high as 7.5, 6.2 and 6.5 percentage points under the high-shock scenario.

It is worth pointing out that there is a lot of uncertainty about remittances. Against a World Bank projection of a steep fall, remittances in the first six months of this year have been rather resilient. On the other hand, given the sluggishness of economic activities in the labour-importing countries and the rising incidents of migrant workers' returning home, one could consider the simulated magnitude of remittance fall in this paper too low. Therefore, in the case of a deeper fall in remittances, household consumption spending would be subject to further deterioration.

The government policy response has some impact in offsetting the pandemic-induced economic consequences. The stimulus packages as announced, if implemented fully, can mitigate 0.6 percentage points impact on GDP under the low shock scenario and 1.1 per cent under the high shock scenario. The packages have various support measures for exports and as such it is found that policy measures can contain export shocks by 3 to 5 per cent under different scenarios. Obviously, given the massive drop in global demand, export shortfalls from the baseline are quite large. A significant export bounce-back is thus dependent on global economic recovery.

Various schemes under the stimulus package is mostly subsidized loan programmes channelled through public and private banks. Therefore, the net injection into the economy is substantially lower than the overall monetary value of the package announced. Furthermore, the proportion of direct support for poor households, which can have instant and significant impact on poverty reduction, in the stimulus package is negligible. Consequently, the poverty impact of the support measures for private households is simulated to be just 0.5 percentage points. The analysis seems to suggest that direct household cash support equivalent to just about 1 per cent of GDP can generate enough economywide activities to bring the poverty incidence level down to the pre-Covid situation under the low-shock scenario. This shows the role of public spending in stimulating the economy from a bottom-up point of view as well. Boosting private demand should constitute a major policy target in the post-lockdown period. This can also indirectly stimulate the supply-side response, contributing to income enhancement, as well as jobs and livelihood opportunities for low and middle-income households who were hit hard by the pandemic.

Given that many services sectors are providers of mass employment, particularly in the informal sector, stimulating activities in these sectors should also receive a special policy attention. Simulation

results show that sectors that are known to have large-scale informal employment such as construction, transportation, tourism, and hotels and restaurants, and agriculture have seen their outputs shrink considerably. Revival of these sectors, which are largely domestic market-oriented, can be aided by policies that help raise aggregate demand.

Finally, this study shows the potential of model-based exercises in providing informed policy inputs. The approach taken here combines the disruptions arising in the global economies with those in the domestic economy to obtain a comprehensive outlook. Also, the used GTAP framework allows cross-country comparisons to gain further insights. It is however important to consider caveats of such exercises. Models greatly simplify complex matters of the real world, and the derived results depend on certain assumptions to make them operational. Also, such issues as institutional effectiveness and/or the quality of public spending, for example, in delivering the targeted outcomes are difficult to consider. Nevertheless, an ex-ante model-based assessment can greatly assist the policymaking process by considering alternative options and scenarios within a well-founded analytical framework. Given the evolving circumstances, it is important to continually update the likely scenarios to assess appropriate policy implications.

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Annex

Table A1: COVID-19 impact on GDP (deviation from the baseline)

	GDP ($ million)			GDP (%)		
	Low shock scenario	Medium shock scenario	High shock scenario	Low shock scenario	Medium shock scenario	High shock scenario
Bangladesh	-11,146.0	-18,746.5	-28,013.9	-3.7	-6.2	-9.3
Cambodia	-731.5	-1,101.5	-2,203.5	-3.1	-4.7	-9.4
China	-834,570.0	-1,056,728.0	-1,399,735.0	-6.6	-8.3	-11.0
India	-133,057.3	-174,697.0	-253,747.3	-5.0	-6.6	-9.6
Indonesia	-25,219.8	-39,073.7	-55,695.3	-2.7	-4.2	-6.0
Philippines	-8,738.3	-13,581.8	-20,375.1	-2.7	-4.2	-6.4
Thailand	-15,865.2	-24,905.2	-38,380.5	-3.6	-5.7	-8.8
United Kingdom	-139,003.5	-203,040.5	-271,990.5	-5.0	-7.4	-9.9
Vietnam	-6,502.4	-9,430.3	-19,941.4	-2.8	-4.0	-8.7

Source: Authors' estimation based on GTAP model.

Table A2: Impact of Covid-19 on sectoral output (per cent deviation from the baseline)

	Low shock scenario	Medium shock scenario	High shock scenario
GrainsCrops	-1.8	-3.0	-4.3
MeatLstk	-2.4	-4.0	-6.0
ForestFish	-1.8	-3.2	-4.8
Coal	0.7	1.7	4.1
Oil	5.8	9.2	26.8
Gas	-2.3	-3.7	-4.8
Otherextract	-0.9	-1.8	-1.9
ProcFood	-3.4	-5.5	-9.0
Textiles	-8.0	-11.5	-18.2
Apparel	-7.8	-11.3	-14.7
Leather	-15.3	-23.3	-31.1
LightMnfc	-0.1	-0.3	2.7
Pharma	-4.3	-6.3	-7.4
HeavyMnfc	-3.5	-5.5	-4.7
Utility	-3.0	-4.9	-6.4
Construction	-4.4	-6.7	-9.2
Accomodation	-2.7	-4.2	-5.4
Transport	-2.7	-4.5	-6.3
Communicatio	-3.5	-5.3	-7.2
InsrFinancia	-1.7	-3.0	-4.4
Recreation	-3.8	-6.5	-9.5
Education	-3.5	-6.1	-9.0
Health	-4.1	-6.9	-10.3
OthServices	-0.7	-1.8	-3.4

Source: Authors' estimation based on GTAP model.

Table A3: Impact on exports (deviation from the baseline)

	Exports ($ million)			Exports (%)		
	Low shock scenario	Medium shock scenario	High shock scenario	Low shock scenario	Medium shock scenario	High shock scenario
Bangladesh	-4634.1	-6683.2	-9422.1	-10.56	-15.24	-21.48
Cambodia	-693.0	-988.2	-1464.9	-3.35	-4.78	-7.09
China	-309665.3	-428942.3	-619319.5	-11.29	-15.63	-22.57
India	-53626.8	-77368.7	-107409.4	-11.71	-16.90	-23.46
Indonesia	-16991.5	-23795.1	-36984.2	-8.90	-12.46	-19.37
Pakistan	-3909.5	-5648.2	-8617.8	-12.95	-18.70	-28.54
Philippines	-6761.3	-9733.9	-13680.8	-9.99	-14.38	-20.21
Vietnam	-6328.1	-8999.6	-15347.3	-3.35	-4.76	-8.11

	Low shock scenario	Medium shock scenario	High shock scenario
GrainsCrops	-9.4	-12.5	-21.6
MeatLstk	0.2	4.4	-6.9
ForestFish	-9.0	-9.6	-9.9
Coal	-	-	-
Oil	-	-	-
Gas	-	-	-
Otherextract	2.5	5.0	8.8
ProcFood	-13.2	-19.2	-25.1
Textiles	-34.5	-45.3	-57.9
Apparel	-7.9	-11.4	-14.9
Leather	-28.0	-42.1	-56.3
LightMnfc	-17.2	-25.0	-28.6
Pharma	-30.5	-43.5	-56.4
HeavyMnfc	-27.3	-41.1	-51.2
Utility	-9.3	-12.1	-11.2
Construction	65.2	93.5	145.7
Accomodation	-34.6	-47.2	-55.7
Transport	-24.5	-32.9	-38.0
Communicatio	0.4	1.5	5.0
InsrFinancia	4.0	7.8	14.9
Recreation	-18.5	-22.9	-23.8
Education	1.4	4.1	9.1
Health	0.3	2.7	7.1
OthServices	-1.6	-0.9	1.3

Source: Authors' estimation based on GTAP model.

Table A4: Impact on GDP after adjusting for stimulus packages

	GDP ($ billion)			GDP (%)		
	Low shock scenario	Medium shock scenario	High shock scenario	Low shock scenario	Medium shock scenario	High shock scenario
Bangladesh	-6812.7	-14413.2	-23680.7	-2.25	-4.77	-7.84
Cambodia	-700.4	-1070.4	-2172.4	-3.00	-4.58	-9.29
China	-642475.0	-864633.0	-1207640.0	-5.07	-6.82	-9.53
India	-97777.0	-139416.8	-218467.0	-3.68	-5.25	-8.23
Philippines	-4964.2	-9807.7	-16601.0	-1.55	-3.07	-5.19
Vietnam	-3025.6	-5953.5	-16464.7	-1.32	-2.60	-7.19

Source: Authors' estimation based on GTAP model.

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