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Costs of LDC graduation on market access: evidence from emerging Bangladesh

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ABSTRACT

We empirically estimate the costs of LDC graduation on market access for Bangladesh using a computable general equilibrium modelling framework. If developed countries impose standard generalized system of preferences (GSP) tariffs while importing from Bangladesh and at the same time Bangladesh eliminates its export subsidies, our modelling suggests that real gross domestic product (GDP) may drop by about 0.38 per cent and exports could fall by about six percent for Bangladesh. The ready-made garment sector could be affected severely, with results suggesting exports could decline by about 14 per cent. Our analysis indicates that the income of urban households could decrease by three per cent, and household consumption may shrink by about four per cent. To minimize these potentially adverse impacts, Bangladesh should aim to ensure market access continues through signing preferential trade agreements. In addition, streamlined subsidy policies, enhanced domestic productivity, export diversification, and increased foreign investment, are likely to be important areas of focus for a smooth LDC graduation.

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1. Introduction

LDC graduation is a watershed moment for any emerging economy. The LDCs are very specific low-income developing countries that are more vulnerable compared to other developing countries. The United Nations Committee for Development Policy (UNCDP) classified the LDCs in the 1960s in UN resolution 2768 (XXVI).[1] The WTO and the World Bank follow this classification for their different preferential tariffs and loan arrangements. The UNCDP reviews and monitors the status of LDCs and makes recommendations on graduating from the category.

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[1] https://www.un.org/development/desa/dpad/least-developed-country-category.html.

There are currently 46 LDCs on the United Nations' (UN) list,[2] 35 of which have become members of the World Trade Organization (WTO).[3] These 46 LDCs consist of 986 million people but account for only 1.3% of global GDP and 0.9% of global trade (World Bank, 2020). Interestingly, a number of these countries will be graduating in a few years, marking a significant development achievement. For example, Bhutan is set to graduate in 2024 while Bangladesh, Lao PDR and Myanmar will do so in 2026.

Bangladesh has been recommended for graduation after meeting all three thresholds for LDC graduation, namely gross national income (GNI) per capita, human asset index (HAI), and economic vulnerability index (EVI), as reviewed by the Committee for Development Policy (CDP) of UN Economic and Social Council in 2021.[4] Bangladesh has been a frontrunner among LDCs in South Asia, with an average economic growth rate approximating 6.5% over the last decade, including a growth rate of 6.9% in 2021, during the Covid-19 pandemic (Bangladesh Economic Review, 2022). Bangladesh has become a global role model for its socio-economic development miracle from a "basket case" as dubbed by Henry Kissinger in 1971.

Bangladesh has made significant progress on the GNI per capita, HAI,[5] and EVI.[6] The GNI per capita has increased five-fold over two decades (Figure 1). With respect to GNI per capita, the graduation threshold is US$1222, and Bangladesh's is at US$1827 in 2021. The country has also surpassed Pakistan and India in GNI per capita.[7] However, compared to the developing country average (US$6666), it is still much lower.[8]

Bangladesh has also made remarkable progress in its socio-economic development. The adult literacy rate has increased sharply over the decades and the mortality rate has also dropped significantly. As reviewed by the CDP, the HAI index for Bangladesh accounted for 75.3 in 2021, where the threshold level for graduation is 66. However, Bangladesh remains behind the developing countries' average HAI index of 78.3.

The EVI shows how vulnerable a country is in terms of economic and environmental shocks. Although the GNI per capita and HAI have substantially increased over the decades, the EVI has not decreased considerably, due to ongoing environmental vulnerability. The EVI index was 34 in 2000 and 27 in 2021 while the threshold is 32 or below.[9] As Bangladesh continues to face different types of environmental shocks – both natural and human-related disasters – there is a huge scope for reducing environmental vulnerability.

[2] As of 11 February 2021, United Nations Committee for Development Policy (UNCPD), https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/publication/ldc_list.pdf.

[3] Understanding the WTO – Least Developed Countries, https://www.wto.org/english/thewto_e/whatis_e/tif_e/org7_e.htm.

[4] UN (2021) Graduation from the LDC category, https://www.un.org/development/desa/dpad/least-developed-country-category/ldc-graduation.html.

[5] The HAI comprises six social indicators which are (1) Under-five mortality rate, (2) Gross secondary school enrolment ratio, (3) Prevalence of stunting, (4) Adult literacy rate, (5) Maternal mortality rate and (6) Gender parity index for gross secondary school enrolment.

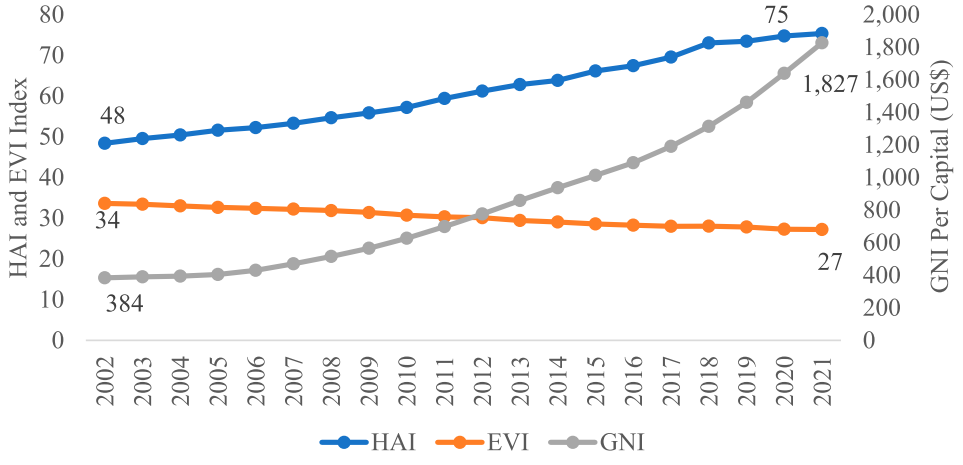
[6] The EVI comprises eight indicators which are (1) Share of agriculture, forestry and fishing in GDP, (2) Merchandise export concentration, (3) Instability of exports of goods and services, (4) Instability of agricultural production, (5) Share of population in low elevated coastal zones, (6) Remoteness and landlockedness, (7) Share of population living in drylands, (8) Victims of disasters. The lower index, the lower the risk.

[7] The UNCDP prepared the data for 2021 for a triennial review averaging the value of GNI per capita over the last three years. United Nations; https://www.un.org/development/desa/dpad/least-developed-country-category-bangladesh.html.

[8] Ibid.

[9] Ibid.

Figure 1. Trend of HAI, EVI and GNI per capita.



Source: UN CDP database, accessed on 10 September 2021 (triennial review report).

Against this background, Bangladesh is set to graduate from the LDC category by 2026. On one hand, graduation from the LDC category may give Bangladesh more self-dignity and some economic benefits, including an improved credit rating and a more attractive environment for foreign investment. However, on the other hand, Bangladesh will lose preferential market access to many countries. It must also eliminate domestic trade-restrictive policies, especially export subsidies and the country may no longer enjoy some concessional official development assistance or loans (WTO & EIE, 2020).

The WTO (2020) analyses the varying impacts resulting from LDC graduation, including summarizing smooth graduation options. Specific to Bangladesh, the United Nations Department of Economic and Social Affairs (2019) qualitatively analyses the possible effects of LDC graduation which relate to trade and development cooperation. The Economist (2018) observes that although Bangladesh will miss out on concessional financing and preferential market access to export markets upon graduation, the graduation will help to attract foreign investments as it stands as a testament to Bangladesh's good growth performance over the years. However, graduation may come at a social cost, as evidenced by Islam et al. (2020), who empirically examine the social aspects of LDC graduation in Bangladesh, particularly its impact on insulin prices. They explore how intellectual property (IP) provisions in the WTO will impact Bangladesh's insulin prices and their subsequent impacts on welfare and poverty upon graduation. The results show that the social cost of LDC graduation leads to a significant jump in insulin prices that could cause a huge decline in households' welfare.

Southichack (2017) explores the costs and benefits of LDC graduation for Lao PDR and concludes that graduating with a solid economic foundation is vital for Lao PDR's success and sustainability. Acharya and Rasphone (2017) echo the same sentiment in their paper. Ancharaz (2019) discusses the flexibility offered through a smooth transition, along with fall-back options available to Small Island Developing Countries (SIDS) LDC graduates. He argues that there is sufficient time for these SIDS to chalk out plans

and develop institutional capacities for a successful graduation. All these show both positive and negative impacts that come with graduation, which could vary from country to country.

When Bangladesh graduates from LDC status to a developing country, Bangladesh will in principle lose most of its preferential market access after graduation. The country will not only lose preferential market access but also lose preferential rules of origin reserved for LDCs. However, Bangladesh would remain eligible for the standard Generalized System of Preference (GSP) which are preferential tariffs that are lower than Most Favoured Nation (MFN) tariffs in the EU and some other developed markets.

The EU is the biggest trading block which provides three types of GSP for developing countries: standard GSP, GSP plus (+), and Everything but Arms (EBA) arrangement.[10] Under the EBA, the EU grants duty-free market access for all imported products except arms from LDCs like Bangladesh, which will be eliminated after graduation and standard GSP will be in place instead. Moreover, as an LDC, Bangladesh has also been enjoying duty-free market access in most developed markets under the Duty-Free Quota-Free (DFQF) arrangement of the WTO. Recently China has offered duty-free market access for 98% of tariff lines under the Asia Pacific Trade Agreement (APTA) and DFQF. Bangladesh has also been enjoying different preferential markets in India and other South Asian markets under the South Asian Free Trade Agreement (SAFTA). Therefore, Bangladesh has been enjoying preferential market access in most key global markets under GSP, DFQF, or regional free trade agreements.

Bangladesh has significantly benefited from the EU's preferential treatment over the decades, even in the post-MFA era (Ahmed, 2009; Alam et al., 2017). Bangladesh's exports to the EU were US$1.5 billion in 2001, which increased to US$26 billion in 2019 (Europa, 2020). The utilization rate of the GSP in the EU market is about 96% which indicates that Bangladesh has been very successful in exporting its products to the EU market (Appendix Figure A1). However, this also implies that Bangladesh is highly dependent on the EU's GSP, and any preference erosion may have a significant negative impact on Bangladesh's exports to the EU. The EU has also benefited from lower prices when importing from Bangladesh, which increased economic welfare in the EU (World Bank, 2020).

Additionally, many other regulatory issues must be compatible with the global trading system. Export subsidies, especially for industrial products, have to be eliminated after graduation, at least in principle.[11] Other WTO members could – if subsidies are not eliminated – take action against Bangladesh under Article 4 of Subsidies and Countervailing Measures (SCM) of the WTO and ask for the withdrawal of the subsidy.[12]

Bangladesh has been using different instruments to support its export sector. The main tools are bonded warehouse facilities, duty drawbacks, direct export cash incentives, various tax concessions, tax holidays scheme, and export credits. Three main support measures were duty drawbacks, a bonded warehouse, and cash subsidies which comprised about

[10] Under the standard GSP and GSP *plus(+)* arrangement, the EU grants tariff reductions for products covered by about 66% of tariff lines originating from developing countries, depending on countries' socioeconomic performance (Europa, 2020).

[11] The WTO prohibits most direct export subsidies, except for LDCs. However, it is evident that many countries provide different subsidies and may not inform the WTO regularly.

[12] The WTO rules on subsidies and countervailing measures in non-agricultural (industrial) goods are contained in article VI and XVI of GATT 1994 and in the "Agreement on Subsidies and Countervailing Measures (SCM)" which prohibits most direct export subsidies, except for LDCs.

3.7% of GDP in 2018. Bangladesh's main export item is ready-made garments (RMG),[13] which comprised about 87% of Bangladesh's total exports in 2019 (Bangladesh Bank, 2020). Therefore, most of these export subsidies of about US$11 billion go to the apparel sector.

Against this backdrop, the main objective of this study is to quantify some key aspects of the economic impact of Bangladesh's graduation from LDC status. This represents an important case study of an emerging economy that may have valuable policy insights for other LDCs.[14] We deploy the MyGTAP framework developed by Walmsley and Minor (2013), an extension of the standard GTAP model (Hertel, 1997). This framework allows us to incorporate country specific information to investigate the impacts of trade policies on different household groups (Walmsley & Minor, 2013). We include 10 rural and urban regional households, which enables us to explore the potential economic impact of LDC graduation on the national economy as well as households' incomes and consumption.

Bangladesh's preferential market access and export subsidies are discussed in the following section. Section three explains the MyGTAP model methodology and how we incorporate Bangladesh's social accounting matrix (SAM) into the GTAP framework. We then present findings from simulations in the fourth section, including analysis of the long-term policy impact and testing the robustness of results before making some concluding comments.

2. Bangladesh trade regime and preferential market access

2.1. Bangladesh trade regime

In 2019, Bangladesh had a real GDP growth rate of 8.2%, compared to the South Asian average of 5.5% (WDI, 2020). Bangladesh's total trade has increased from US$27 billion in 2006 to US$111 billion in 2019, with a trade openness ratio of about 38% in 2019, which reflects how integrated the country is with the global economy (Appendix Figure A2). Bangladesh exported US$47.4 billion to the world in 2019, with top destinations including the EU, the US, Japan, Canada, and India. Bangladesh's weighted average applied tariff rates decreased moderately over the decade from 21% in 2006 to 10% in 2019 (World Bank, 2020).

Bangladesh's main export items are knitwear (HS61), woven garments (HS62) and home textiles (HS63), which together accounted for 86% of total exports in 2020, as shown in Appendix Figure A3. Bangladesh also exports some jute and jute products, footwear, agricultural products and frozen food products. Bangladesh's leading export destination is the EU which accounted for about 56% of its total exports in 2020, followed by the USA (17%) and Japan (4%). Bangladesh's export to its neighbours, especially China and India, is less than one billion dollars (Appendix Figure A4).

Over the past decade, Bangladesh's export boom, particularly in the ready-made garments sector, has helped Bangladesh to achieve significant economic growth. This success in the apparel industry is linked with an abundance of low-skilled labour, positively related

[13] The apparel industry in Bangladesh is mainly readymade garments (RMG), the finished products. The average MFN import duty is about 10% on RMG products, which most countries will impose on imports from Bangladesh.

[14] Many other LDCs, including Bhutan, Cambodia, Lao PDR, Nepal and Myanmar, will graduate to developing country status within the next few years.

to backward linkages in global value chains (GVCs). According to the United Nations Economic and Social Commission for Asia and the Pacific, Regional Integration and Value Chain Analyzer (UNESCAP RIVA)[15] 2017 database, Bangladesh's forward linkages constituted 13.2% and backward linkages constituted 14.1% of its gross exports to the world. The main sector that leads Bangladesh's GVC participation in both forward and backward linkages is the textiles and clothing sector. About 16.1% of Bangladesh's RMG sector gross exports to the world comprise imported content and 10.9% of Bangladesh's RMG sector gross exports to the world are used in further export production. The textile sector is by far the most important sector for Bangladesh that participates in GVCs.

Frederick and Staritz (2012) provide evidence of successful upgradation of the apparel industry in the post-multi-fibre arrangement (MFA) period. Gereffi and Memedovic (2003) show how the GVC framework has transformed the apparel industry over the past decade. Bangladesh has successfully upgraded its manufacturing plants and management skills (Moazzem & Sehrin, 2016). The World Bank's (2020) report on GVCs shows that Bangladesh has successfully integrated its apparel sector using its large pool of low-skilled, low-cost workers. The report also indicates Bangladesh has successfully utilized its preferential market access in the global apparel industry, which plays a critical role in the Bangladesh economic growth miracle. However, Bangladesh has higher backward GVC participation of imported intermediates and capital goods to its gross exports than its forward GVC participation, reflecting a pattern of exports largely focused on final goods rather than intermediates (UNCTAD, 2020). As the country prepares to graduate from being an LDC, upgrades from the firm level up are needed in terms of efficient processes and functions, more sophisticated products, and overall value chain linkages.[16]

2.2. Preferential market access

Table 1 summarizes the ways in which Bangladesh will lose preferential market access and other preferential treatment with graduation. Table 2 shows the current level of preferential market access that Bangladesh and many other LDCs have been enjoying over the decades. The EU, Canada, Japan, Australia and some other countries mostly offer duty-free market access when importing from LDCs.

Tariffs on the apparel sector are much higher in the EU, USA, China, Japan, and Canada compared to the average applied tariff on industrial products.[17] Table 2 shows the average standard GSP tariff of the apparel sector for selected markets. The MFN-applied tariffs and standard GSP on the apparel sector are comparably higher in most countries (WTO, 2020) compared to manufacturing products. The MFN tariffs on the apparel sector are much higher in the EU than the average applied tariffs on industrial products. The EU has tariff protection of about 4% for fabrics, 8% for semi-finished garments and 12% MFN rate for clothing (Europa, 2020). As 87% of Bangladesh's exports are garments, most of these would face standard GSP tariffs of 9.6% in the EU (WTO, 2020). This indicates that Bangladesh may face high tariffs exporting to most of the developed markets after graduation. However, the USA had suspended GSP importing from Bangladesh in 2013 and offered a 97%

[15] https://riva.negotiatetrade.org.

[16] The Participation of Developing Countries in Global Value Chains: Implications for Trade and Trade-Related Policies, OECD Summary Paper, 2015.

[17] The simple average applied EU import tariff was 4.35% on industrial goods in 2019.

Table 1. Impact of LDC graduation on preferential treatment for Bangladesh.

Main issues	Potential loss
Loss of preferential market access under WTO's DFQF	Bangladesh will lose access to LDC-specific DFQF schemes
Loss of EBA preference	EU and other developed country market access under EBA scheme (another type of GSP of EU) for LDCs
Loss of LDC-specific rules of origin	Bangladesh will lose LDC-specific preferential rules of origin
Subsidy elimination	Bangladesh must eliminate export subsidies and comply with the Agreement on Agriculture (AoA) and the Agreement on Subsidies and Countervailing Measures (SCM)
Trade-Related Intellectual Property Rights (TRIPS) bindings	Bangladesh may face some negative shocks but needs to align with TRIPS, especially for the pharmaceutical sector. This may have a huge impact on drug prices
No more concession loans and development assistance	Bangladesh may not be able to access concession rate loans and some development assistance, support, climate finance, training, etc. from the UN
High UN contributions	Bangladesh will have to pay higher contributions to the UN

Source: Authors' compilations from UN LDC portal (2021).

tariff line under DFQF but did not provide any duty-free market access for the apparel goods imported from Bangladesh.

Table 2 also shows a major erosion of preference of the post-graduation rules of origin scenario for the major markets. In the EU market, 50% of domestic contents will be required compared to the current 30%, and double transformation will be required for clothing exports (e.g. from yarn to fabric to clothing) compared to the current single transformation (e.g. from fabric to clothing). Similar rules of origin requirements will apply for most developed markets, which will negatively impact Bangladesh's exports.

2.3. Export subsidies scenarios

Bangladesh has been using different supporting instruments to boost its export over the years. The main mechanisms are the bonded warehouse facilities,[18] duty drawbacks,[19] direct export cash incentives, various tax concessions, tax holidays scheme, and export credits. Table 3 shows the different export incentives ranging from 5% to 20% of exports in various sectors over the decades.

The three main support measures for exports, i.e. duty drawbacks, bonded warehouse facilities, and cash subsidies, accounted for about 3.7% of GDP in 2018, 22.5% of the revenue budget and 56.5% of the development budget (Table 4). Recently, the government of Bangladesh has declared an additional US$560 million cash subsidy to rescue exports from the COVID-19 pandemic.[20]

[18] Bangladesh's customs bonded warehouse regime allows the importation of duty-free parts and materials required for export production purposes by licensed manufacturers. The bonded warehouse facilities are mostly used by RMG industries.

[19] Under the provisions of Section 13 of The Value Added Tax Act, 1991 and under Section 37 of The Customs Act, 1969 of the Bangladesh government, all import duties and taxes paid on raw materials and inputs used for the manufacture of exported goods or services shall be refunded.

[20] The government of Bangladesh has declared 16 stimulus packages equivalent to US$11.7 billion, which is about 3.4% of the GDP in 2020, to combat the Covid-19 pandemic and rescue the economy. Of these packages, an additional US$560 million (BDT 50 billion) are allocated to export subsidies (2020), Socio-Economic Development in Bangladesh & Stimulus Packages to Combat COVID-19, Retrieved from https://mof.gov.bd/site/publications/bdf6a97c-7327-4868-b985-7833fdb83574/Socio-Economic-Development-in-Bangladesh-&-Stimulus-Packages-to-Combat-COVID-19.

Table 2. Selected market access of Bangladesh for the RMG sector.

Country	Scheme	Coverage	Standard GSP applied tariff rate	Rules of Origin (RoO) for post-LDCs
EU	GSP under EBA initiative	99.8% (excluding arms and ammunition)	9.6% where MFN-applied rate is 12%	(a) 50% domestic content will be required compared to the current 30%. (b) Double transformation will be required for clothing exports
USA	DFQF under WTO. GSP suspended in 2013	97.5% except the apparel sector	9.1% where MFN-applied rate is 9.8%	35% domestic content requirement and no impact will be on LDC graduation as the GSP has been suspended since 2013
China	DQFQ and APTA	97%	0 (APTA) where MFN-applied rate is 9.69%	APTA RoO: (a) 45% value addition will be required (currently 35%). (b) 60% regional cumulation will be allowed (currently 50%)
Canada	GPT–LDC	98.6% (excluding dairy, eggs, poultry)	9.4%	Under general preferential tariff (GPT) 40% of import content will be allowed compared to the current 60% as an LDC
Japan	GSP and DFQF market access	97.9% (excluding rice, sugar, fishery, leather)	6.5% where MFN-applied rate is 7.1%	Single transformation will be allowed but must follow standard GSP RoO
Korea	APTA	89.9% under LDC but 0 under APTA	0 (APTA) where MFN-applied rate is 10.1%	Under APTA 45% domestic value addition will be required compared to the current 35%. Regional cumulation will allow with value addition requirement of 60% (currently 50%)
India	SAFTA	All except 25 products under SAFTA LDC	5% (SAFTA non-LDC) where MFN-applied rate is 23.6%	No change of tariff heading allowed and must follow product-specific non-LDC rules of origin

Source: Authors' compilation from UN LDC Portal (2021), WTO Tariff Profile (2020), SAFTA (2020), UNESCAP and APTA (2020), China Blue Book (2020). https://www.un.org/ldcportal/preferential-market-access-for-goods.

Table 3. Selected sectoral cash incentives on Bangladesh's exports.

	Rate of cash incentives in each fiscal year (%)							
Sectors/products	2010	2011	2012	2013	2014	2015	2016	2018
Local textiles fabrics	5	5	5	5	5	5	5	4
Frozen fish and shrimp	10	10	12.5	10	10	10	7.5	15
Leather goods	15	15	17	15	15	15	15	15
Ago-processed goods	20	20	20	20	20	20	20	20
Potato export	10	10	10	10	10	20	20	20
Bicycle export	15	15	15	15	15	15	15	–
Crushed bone	15	15	15	15	15	15	15	15
Jute goods and products	7.5	7.5	10	10	10	10	10	20
Light engineering goods	10	10	10	10	10	10	10	10
Halal meat	20	20	20	20	20	20	20	20
New markets (except USA, EU and Canada) for textile sector						2	2	4
Additional benefit for small textile industry						5	5	4
RMG sector						5	4	5
Shipbuilding sector						10	10	10
Furniture exports							15	15

Source: Authors' compilation from Bangladesh Bank Various SRO (2015, 2016, 2017, 2018, 2020), and Bangladesh Trade Portal (BTP), Ministry of Commerce (MoC), Peoples' Republic of Bangladesh.

Table 4. Bangladesh exports subsidies relative to GDP and the development budget (in billion BDT).

Supports	2008	2010	2012	2014	2016	2018
Tax expenditure for BW	162.3	152.2	202.7	310.5	702.5	766.7
Tax return for DD	0.601	0.884	1.69	1.39	12.5	20.6
Cash subsidy	12.7	15	15.8	17.91	38	50.5
Total support to exports	175.6	168.1	220.2	329.8	753	837.8
GDP at current prices	5458	6147	6943	7874	17329	22505
Support as % of GDP	3.2	2.7	3.2	4.2	4.3	3.7
Revenue budget	605	691	794	951	2231	3714
Support % of revenue budget	29	24.3	27.7	34.7	33.8	22.6
Development budget	184	196	259	330	1204	1483
Support as % of development budget	95.4	85.8	85	99.9	62.5	56.5

Note: BW – Bonded warehouse, DD – Duty drawback.
Source: Authors' compilation from National Board of Revenue (NBR, 2019) and Bangladesh Economic Review Archive (2015–2018), Ministry of Finance Peoples' Republic of Bangladesh.

3. Modelling framework

To comprehensively model the economy-wide impacts of Bangladesh's graduation, we employ computable general equilibrium (CGE) modelling, using the 10a version of the Global Trade Analysis Project (GTAP) database and model. The detailed structure of the GTAP model assumptions, equations, standard closure, elasticities, and parameters, are presented in Hertel (1997), with details of the current database provided in Aguiar et al. (2019). The GTAP framework includes detailed interactions between different sectors within and across countries, as well as regional households and governments.

In this paper, we use the MyGTAP augmentation of the GTAP model, developed by Walmsley and Minor (2013). MyGTAP is a customized and extended version of the GTAP model that enables us to incorporate country-specific data to investigate the impacts of different domestic policies on the household level, with a focus on generating insights for country-specific analysis. While the standard GTAP model assumes a single regional household, in the MyGTAP model, we eliminate the single 'regional' household for

each country, instead incorporating private households and a government (Walmsley & Minor, 2013).[21] The model we employ also permits incorporating factors of production and multiple private households as well as incorporating income from remittances, foreign aid, foreign capital, and government income. In the MyGTAP framework, the government collects income from taxes, duties revenue and foreign aid, spending this income on public consumption, transfers to households, foreign aid outflow, and subsidies. Similarly, private households receive and accumulate their income from factors of productions, transfers from the government and other households and foreign remittances. This accumulated income could be spent on consumption from different sectors, transfers, remittances outflow, and some savings.

3.1. Data extension and aggregation to MyGTAP

The main features of the MyGTAP framework allow us to incorporate country-specific data on households and endowment factors. We incorporate the Bangladesh social accounting matrix data prepared from households' income and expenditure survey (HIES) with the GTAP Version 10 dataset (Aguiar et al., 2019) into the MyGTAP model (Minor & Walmsley, 2013). The latest Bangladesh social accounting matrix for 2012 and has been updated to 2014.[22]

We aggregate the 141 regions and countries in the GTAP 10 dataset into 15 regions and countries (Appendix Table A1a) and the 65 sectors into 10 aggregate sectors (Appendix Table A1b). Our regional aggregation emphasizes countries that are the leading trading partners of Bangladesh, including the United States and European Union, China and India. We aggregate the 65 GTAP sectors into 10 sectors, taking the available Bangladesh SAM into account since mapping is required between the sectors of the Bangladesh SAM and GTAP sectors, and with the aggregated regions. We then use the household consumption and ownership weights acquired from the SAM (2014) and incorporate them into the MyGTAP model. The 10 aggregated sectors are mapped to the corresponding sectors in the Bangladesh SAM to determine each household's share of consumption. We incorporate income and consumption data for 10 different households based on the income level of Bangladesh's rural and urban regional households.

Factor ownership shares are used to allocate earnings to each of the 10 households, with household incomes then adjusted for net foreign income, remittances, and capital depreciation, as suggested by Minor and Walmsley (2013). This dataset provides a starting point from which we investigate the effects of removing export subsidies both on households and at the overall country level. A summary description of the Bangladesh social accounting matrix and database used in this study is provided in Table 5.

Table 5 shows the structure and share of different economic sectors in Bangladesh, as shown in the 2014 SAM. Grains and crops are the leading categories in the agriculture sector, contributing 11.1% of value added in the economy. The textile and clothing sector is the leading industrial category that contributes a 7.2% share in the economy. This sector is

[21] Refer to Walmsley and Minor (2013) and Minor and Walmsley (2013), for full documentation of the MyGTAP data program and model, https://impactecon.com/resources/working-papers/.

[22] The updated SAM was provided by Dr Selim Raihan from South Asian Network for Economic Modelling (SANEM), a think-tank in Bangladesh.

Table 5. Structure of the Bangladesh economy in the updated SAM 2014 (%).

Aggregated sectors	Value added	Exports' share of output	Share of total exports	Imports relative to output	Share of total imports
1. Grains and crops	11.1	0.4	0.9	8.5	8.2
2. Livestock, fisheries and meat products	1.3	0.1	0.3	2.4	0.3
3. Mining and extraction	6.8	0.2	0.1	1.9	0.7
4. Processed food	1.4	1.5	1.6	17	9.1
5. Textiles and clothing	7.2	51.6	87.1	17.6	20.1
6. Light manufacturing	1.9	2.4	1.8	23.3	9.4
7. Heavy manufacturing	1.0	1.2	1.3	59.1	41.2
8. Utilities and construction	17.02	–	–	–	–
9. Transport and communication services	28.31	2.87	6.3	4.99	4.65
10. Other services	23.9	0.25	0.7	4.88	6.33
Total	100		100		100

Source: SAM (2014).

Table 6. Share of household income from different factors of production (%).

	Land	Capital	Natural resources	Unskilled labour	Skilled labour
Landless household	0	34	2.8	53.3	10
Marginal farmer	4.6	37.1	2.9	45.5	9.9
Small farmer	10.5	29.7	1.6	48.1	10.1
Large farmer	23.2	16.9	2.6	48.2	9.2
Rural day labourer	4.5	25.3	2.5	55.7	12
Rural self employed	3	71.6	0.9	19.4	5.1
Rural employee	3.4	54.8	2	27.4	12.5
Urban day labourer	2.1	13	2.7	71.8	10.3
Urban self employed	2.1	48.9	1.3	24.5	23.1
Urban employee	2	29.9	2	27.2	38.9

Source: Bangladesh 2014 SAM.

highly export-oriented, with about 87.1% of total exports coming from textiles and clothing, while comprising under 20.1% of imports (Table 5). Bangladesh is heavily dependent on importing in the heavy manufacturing sectors, which is about 41.2% of total imports, especially intermediate capital goods.

Table 6 shows factor ownership by rural and urban households while Table 7 demonstrates how these factors of production are employed in different sectors. Table 6 illustrates where the income comes from for these 10 households. Unskilled labour is particularly important in the agricultural sectors, as indicated in Table 7. The tables depict that urban day labourers get most of their income from unskilled employment, and 42% of value added in the textile and apparel sector is contributed by unskilled labour.

3.2. Updating Bangladesh export subsidies rate

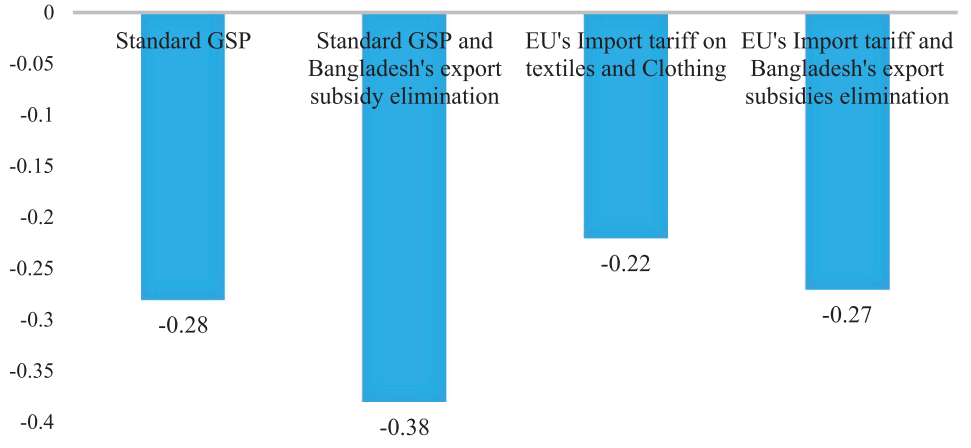
The government of Bangladesh (Ministry of Finance) declares subsidies every year in June, and the Central Bank (Bangladesh Bank) implements the decision made by the government. However, the GTAP version 10 database uses the WTO's export subsidies dataset, which does not appear to accurately reflect Bangladesh subsidies. Therefore, we update these subsidies in the pre-simulation database, employing the *Altertax* method (Malcolm, 1998). This procedure aims to maintain the consistency of the value flows in the database as much as possible while integrating the updated subsidy rates (Burfisher, 2017;

Table 7. Share of factor of production in sectoral value added (%).

	Land	Capital	Natural resources	Unskilled labour	Skilled labour
Grain and crops	47.6	0	0	48.9	3.6
Meat and livestock	0	34.1	0	64.9	1
Extraction and mining	0	47.6	33.6	17.9	0.9
Process food	0	63.1	0	26	10.9
Textiles and clothing	0	40.2	0	42.2	17.6
Light manufacturing	0	54.9	0	31.9	13.3
Heavy industry	0	61.3	0	27.3	11.4
Utilities and construction	0	84.7	0	7.8	7.5
Transport and communication	0	38.7	0	49.7	11.7
Other services sector	0	57.8	0	9.4	32.8

Source: Bangladesh 2014 SAM.

Figure 2. Impact of LDC graduation on real GDP (% change).



Source: Authors' simulation.

Siddig et al., 2014). Bangladesh's government has been providing an average of about a 10% export subsidy over the last decade therefore this is integrated into the updated data from which we run our policy simulations.

3.3. Simulation scenarios

Given that Bangladesh is set to graduate from being an LDC by 2026, Bangladesh must prepare for the post-graduation environment in which it will not be able to access preferential market access under the WTO's DFQF framework and preferential GSP, including EBA arrangement in the EU market. We simulate the following four scenarios to generate insights into the potential impact of graduation on Bangladesh:

- Under scenario one, we explore the potential impact if the EU, UK, Japan, Canada, and Australia impose standard GSP tariffs on imports from Bangladesh. As Bangladesh has been enjoying preferential tariffs under SAFTA, we also apply SAFTA non-LDC

tariffs. We do not consider Korean and Chinese MFN tariffs as they give about 97% tariff lines duty-free under APTA and DFQF. We also do not consider changes in USA tariffs in this simulation as the USA has suspended GSP imports from Bangladesh since 2013.

- Under scenario two, in addition to the tariff changes from the first scenario, we introduce the elimination of export subsidies to selected sectors including textiles and clothing, light manufacturing and agricultural sectors exporting from Bangladesh.
- Under scenario three, we investigate the impacts of only the EU imposing standard GSP tariffs on imports from Bangladesh as the EU is the largest export destination of Bangladesh. The EU standard GSP on ready-made garments is 9.6% (Europa, 2020).
- Under scenario four, in addition to the tariff changes from scenario 3, we also introduce an elimination of export subsidies to all these selected sectors exporting from Bangladesh.

4. Analysis of the simulations results

4.1. Macroeconomic impact

The impact of introducing new tariffs and eliminating export subsidies can be investigated at both the macroeconomic and household levels of analysis. This section presents the simulation results that show the potential impacts on macroeconomic indicators, industry outputs, trade, and households' income and consumption. The overall macroeconomic impacts of the new standard GSP tariffs and elimination of export subsidies modelled are presented in Figure 2. It is evident from the simulations that the increased tariffs and elimination of export subsidies will reduce exports and imports substantially under all four scenarios. The simulation results show that if the EU, Japan, Canada, Australia introduce standard GSP tariffs (Table 2), GDP reduces by 0.28%. If the complete elimination of export subsidies also takes place for Bangladesh it may further negatively impact real GDP (0.38%), exports, imports and household income.

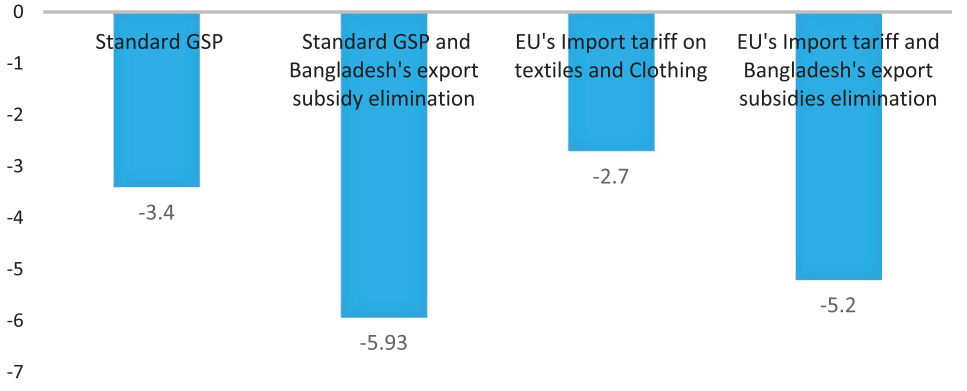
The analysis shows that shrinking exports from Bangladesh could lead to a negative balance of trade impact that could affect GDP. Total exports reduce by about 5.9% under scenario two. This analysis indicates that Bangladesh will face a challenging situation after graduation with this new environment.

In contrast, if the EU only introduces its standard GSP tariff importing from Bangladesh and at the same time if Bangladesh eliminates its export subsidies, real GDP may decrease by about 0.27%. Bangladesh exports fall by 5.2% in this scenario (Figure 3). The analysis indicates that the overall change in the balance of trade is negative and there is a significant negative impact on terms of trade.

4.2. Sectoral output

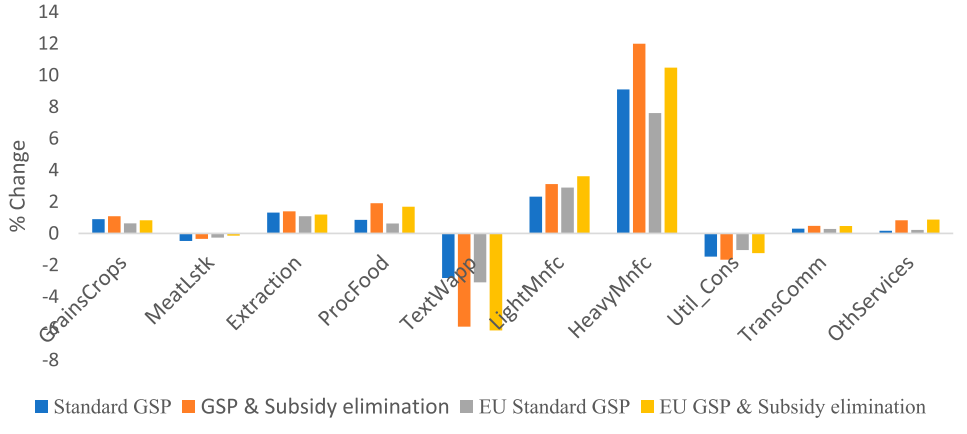
The RMG industry has been enjoying not only duty-free market access, but also various stimulus supports, including cash incentives, duty drawbacks, and bonded warehouse facilities over the decades. If we eliminate the export subsidies and increase tariffs on exports to GSP tariffs when exporting to developed markets this will impact RMG production, as presented in Figure 4.

Figure 3. Impact of LDC graduation on real exports (% change).



Source: Authors' simulation.

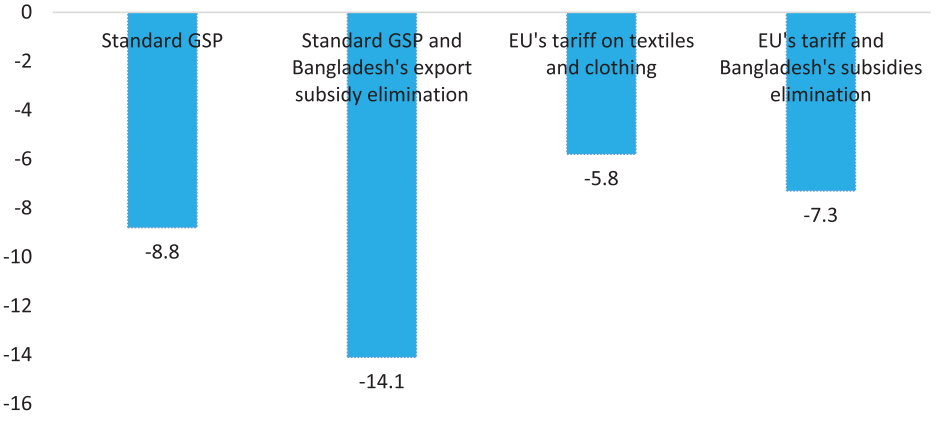
Figure 4. Impact on sectoral output (% change).



Source: Authors' simulation.

Under scenario two if we eliminate export subsidies and impose a 9.6% tariff, the total production of textiles and clothing would be reduced by about 6.1%. But the tariff changes and subsidy eliminations may have a positive impact on the output of other sectors. The industrial sector will face lower tariffs (about 4.3%) than the RMG sector (9.6%) in the EU market, which may increase the output and exports of the non-RMG sector. The other explanation is resource mobilization, with resources moving away from the RMG sector to other industries, leading to higher production of non-RMG sectors. The light and heavy manufacturing sector would experience positive growth. Agricultural output may increase significantly as well, although, the contribution to exports by all these sectors is not very significant compared to the RMG sector. The analysis indicates that the removal of export subsidy may hurt the highly export-intensive apparel sector but will have a positive effect on the output of other sectors (Figure 5).

Figure 5. Impact on the RMG exports (% change).



Source: Authors' simulation.

4.3. Impact on RMG sector

Textiles and clothing are the main export items of Bangladesh, constituting about 87% of Bangladesh's total exports in 2019. Therefore, the RMG sector's exports could be affected adversely post-LDC graduation under all four scenarios. Exports of the ready-made garments sector could fall by 14% under scenario two. However, due to overall increased efficiency through eliminating export subsidies, some of the resources may move out from RMG sector to other sector which may increase exports of light engineering, processed foods, and the agricultural sector.

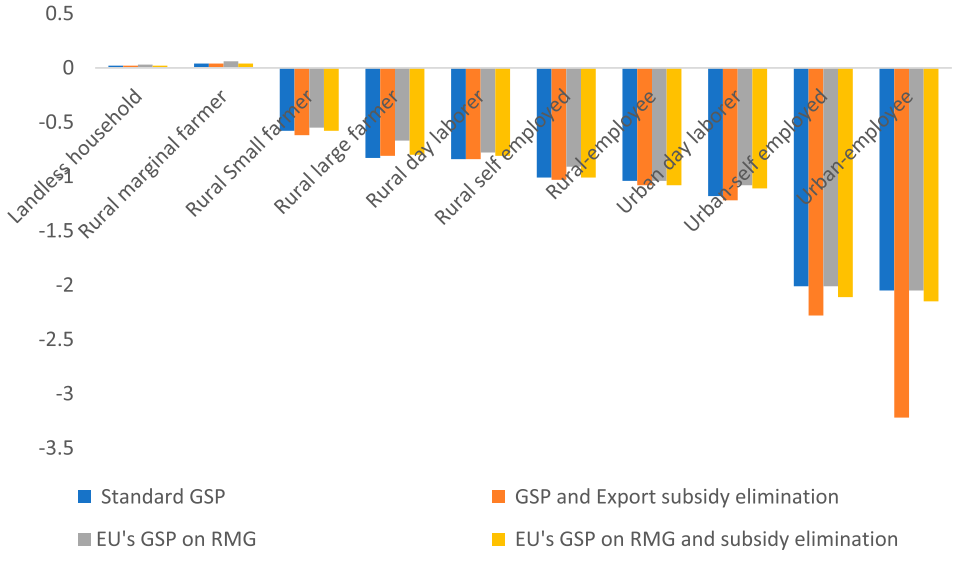
At the same time, imports might decrease substantially in all sectors under all four scenarios, especially intermediates inputs of the RMG sector, which constitutes about 20% of Bangladesh's total imports. Elimination of export subsidies also reduces imports in the light manufacturing industry.

4.4. Impact on households

Given the MyGTAP modelling extension for Bangladesh developed in this paper, we are able to supplement the macroeconomic results with a distributional analysis of household income. The estimated change in household income is shown in Figure 6. The simulation results reveal that real household income declines substantially for urban households under all four scenarios. The real income could be decreased due to reduced income in the RMG sector, in particular, urban households are more linked with export-oriented industries than rural households.

Our results suggest that the income of urban households could decline on average by 3% under scenario two due to a significant fall in RMG exports which will directly affect urban unskilled household income. Due to the elimination of export subsidies domestic prices may increase which leads to lower exports. However, rural household incomes may not fall significantly as their income is not so directly related to the export-oriented ready-made garment industry.

Figure 6. Impact on household incomes (% change).



Source: Authors' simulation.

Urban unskilled households contribute about 42% to value added in the garment industry and are directly affected due to the lower exports that lead to lower output in the apparel sector. According to Haque and Bari (2021), about 4.2 million workers are employed in the apparel sector in Bangladesh. Table 5 shows the contribution of the apparel sector to GDP is about 7.16%. This indicates that urban unskilled labour, which is about 4.2 million people, is particularly affected by the LDC graduation. The Bangladesh Garment Manufacturers and Exporters Association (BGMEA) indicates that women comprise 80% of workers employed in member factories (World Bank, 2012). Rural households, whose main source of income is from agriculture and farming, are likely to be less affected than urban households as they are not so reliant on the RMG sector for their incomes.

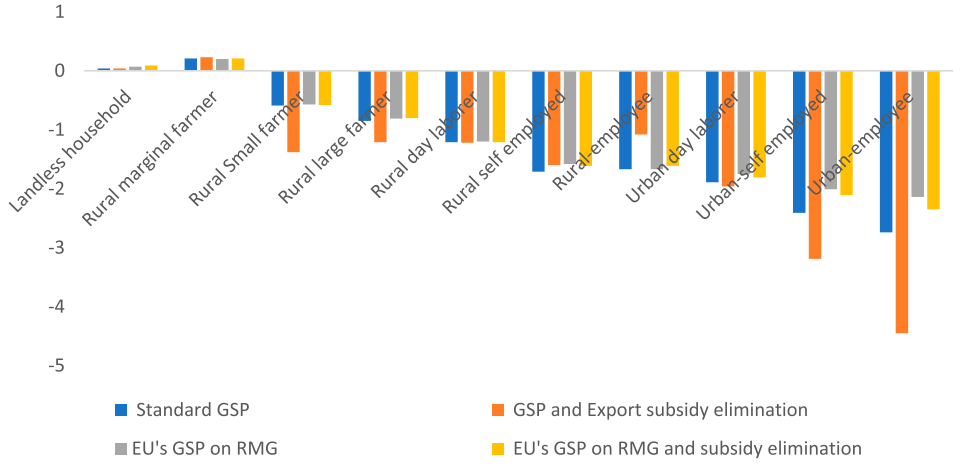
Changes in household consumption under each scenario are presented in Figure 7 and show that consumption may fall by about 4% in the urban area, but the reduction in rural consumption is much smaller. While consumption may decrease substantially among the urban employees who are directly employed in the garments industry, rural workers are more insulated from the impacts of the policy changes modelled.

5. Robustness and sensitivity analysis

5.1. Baseline database for long-term impact simulations

As Bangladesh is set to graduate from the LDC category by 2026, followed by another three years of the transition grace period, we also simulate the impacts of the scenarios from a database that is projected to 2031. These simulations provide insight into how overall results may differ if modelled from a baseline that includes a structural change in the

Figure 7. Impact on household consumption (% change).



Source: Authors' simulation.

Table 8. Baseline average growth projections (% change) of Bangladesh.

	Y2012–2016	Y2017–2021	Y2022–2026	Y2027–2031
Population	0.99	0.88	0.67	0.47
GDP growth rate	6.55	7.03	6.10	5.26
Population (aged 15–64)	1.94	1.60	1.04	0.76

Source: Authors' estimations based on SSP2.

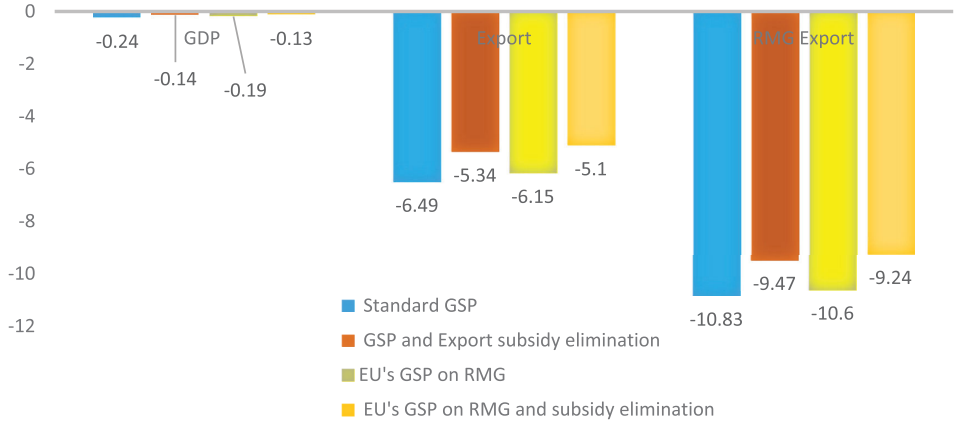
Bangladesh and other world economies at the time the graduation will be implemented.[23] First, we develop a baseline projection of the global economy from 2014 to 2030. Starting with the GTAP version 10 dataset, with a base year of 2014, we exogenously apply growth to population, labour force, and GDP per capita growth to simulate changes in Bangladesh and the other global economies modelled over this period (following Anderson & Strutt, 2016). In particular, we use a middle of the road shared socio-economic pathways (SSP2) projection[24] to estimate the growth rate projections shown in Table 8.

The macroeconomic impact of GSP tariff and elimination of export subsidies modelled from the updated 2031 baseline are presented in Figure 8. The simulations indicate a similar pattern of impact to the comparative static simulations. The results evince that Bangladesh economy will face a challenge in export markets after graduation. The simulation results show that if the EU, Japan, Canada, Australia introduce standard GSP tariffs when importing from Bangladesh, real GDP could fall by 0.24% and total exports may decline by about 6.5%, while exports of the ready-made garments sector could fall by 10.8% in 2031. However, the negative impact of LDC graduation could be lower in the long run due to the increased resilience of the economy over the years.

[23] While useful for sensitivity analysis, given our focus in this study on household impacts which rely on data from the 2014 SAM for which projections into the future are not available, it would not be appropriate to draw detailed household insights from this updated dataset.

[24] https://tntcat.iiasa.ac.at/SspDb/dsd?Action=htmlpage&page=10.

Figure 8. Macroeconomic impacts of LDC graduation in 2031 (% change).



Source: Authors' simulations.

5.2. Sensitivity of results to trade elasticities

As a check on the robustness of results, we undertake a sensitivity analysis of some key parameters. Given our focus on the impact of increased tariffs and reduced export subsidies, we test the impact of assuming different trade elasticities in the modelling. In particular, we double the size of the substitution elasticity between Bangladesh and its trading partners for imported goods. The macroeconomic impact is shown in Appendix Figure A5. The quantitative results of the sensitivity analysis are similar to the main study. Real GDP falls and overall exports drop, particularly RMG exports. Consistent with other literature, we find that pattern of results is similar, but the magnitude of the results does change somewhat with changes in the values of parameters (Timilsina et al., 2018).

5.3. Limitations of the analysis

The economic impacts estimated by CGE models depend on many assumptions including with respect to parameters, data, model specifications and closures. For example, our model assumes perfect competition in all sectors. In the model closure we use, capital and labour are assumed to be fully mobile between sectors, whereas land is treated as moving sluggishly between sectors and government spending is assumed as a constant share of government income. Gilbert et al. (2018) provide a useful review of some strengths and limitations of CGE models for international trade policy analysis.

While our modelling captures bilateral trade flows between Bangladesh and other countries, the CGE model and database we use in this study does not focus on global supply chains, production processes that may shift rapidly between different locations or trade in unfinished goods relative to finished goods. Some limitations of global CGE models which do not fully capture global supply chains are discussed by Athukorala et al. (2018).

In the current study, we only consider the market access issue of LDC graduation, where we model standard GSP-related tariffs and export subsidies elimination scenarios. We do

not consider rules of origin, trade-related intellectual property rights, development assistance, or any other issues Bangladesh may face after graduation. In addition, we do not model the potential benefits through an increased investment that may occur on graduation, or the impact of future trade agreements, both of which may help to offset any negative impacts.

6. Conclusion and policy recommendations

Graduation from the LDCs category may give more self-dignity and some economic benefits through improved credit rating and attract more investment, but at the same time countries will lose preferential market access. Given the impending graduation, Bangladesh needs to have a smooth graduation transition strategy in place so that potential disruptions from the graduation are minimized and its long-term goals are realized.

Bangladesh has been enjoying preferential market access as an LDC in recent decades. The EU, UK, Canada, Japan, Australia and others developed countries offer mostly duty-free market access importing from LDCs like Bangladesh. The GSP utilization rate of Bangladesh in the EU market is 96%, indicating that Bangladesh has substantially benefitted from duty-free market access. Although MFN-applied tariffs on many industrial goods are relatively low in developed markets, the standard GSP rates for the textiles and clothing sector are relatively high in most developed countries (WTO, 2020), and these are the rates Bangladesh will face when exporting to these markets after graduation. Export subsidies are another critical policy issue. Bangladesh has been providing export subsidies of about US$10 billion in 2018, which accounted for about 3.7% of its GDP or about 57% of its development budget. Bangladesh's main export item is ready-made garments; therefore, most of this export subsidy goes to the RMG sectors. As Bangladesh is preparing to graduate from LDC to DC status by 2026, export subsidies, including for industrial products, must be eliminated after graduation.

This study analysed the potential impact of LDC graduation using a computable general equilibrium framework incorporating household data from the Bangladesh social accounting matrix. In particular, we used the MyGTAP program and model developed by Walmsley and Minor (2013) to incorporate country-specific data to investigate the impacts of different domestic policies at the household level. We then simulate four different policy scenarios to evaluate the potential impact of LDC graduation on Bangladesh, starting with imposing the standard GSP tariffs that Bangladesh will face general as a developing country. We then added a complete elimination of the export subsidies. Under scenarios three and four, we introduced the EU's tariff imposition, without and with subsidy elimination.

The findings show that if developed countries (except the USA) impose tariffs when importing from Bangladesh and at the same time if Bangladesh eliminates its export subsidies, Bangladesh's GDP may fall by 0.38%, and exports could fall by 6%. The RMG sector could be affected severely, with exports of the RMG sector declining by 14%. The analysis also indicates that the income of urban households could decline on average by 3%. Real household income may decline substantially for urban households, particularly due to reduced income in the RMG sector and urban household consumption may fall by about 4%.

The simulations also indicate that if the European Union (EU) only imposes standard GSP tariffs while importing from Bangladesh and if Bangladesh eliminates its export subsidies, Bangladesh's real GDP real may fall by about 0.24%. Bangladesh's total exports could fall by about 5.2%, while exports of the apparel sector decline by about 7.2%. Urban household incomes may decrease due to a significant reduction in RMG exports and production.

Graduation will bring some challenges, especially after phasing out of the transition period. Bangladesh has set a target to become an upper-middle-income country by 2031 and an aspiration to be a developed nation by 2041 (Perspectives Plan 2021–2041, Bangladesh Planning Commission). To achieve this ambitious goal, Bangladesh needs a graduation transition strategy to ensure that graduation does not cause disruptions in this long development journey. The economy has undergone substantial structural change over the years. The share of agriculture in GDP has declined from 17% in 2010 to 13% in 2020 (WDI, 2020), with the shares of industry and service sectors increasing steadily. While the economy is growing, an important challenge is the lack of export diversification, both in products and markets. In addition, the current COVID-19 pandemic has significantly impaired overseas employment, which may substantially impact the current account balance. The pandemic has also affected people's health, livelihoods, and employment, especially in the vast informal sector. Low productivity, the informal labour market, workplace safety issues, controlling disease outbreaks, and dealing with environmental disasters are critical issues the country needs to tackle to ensure sustained economic growth.

Our study indicates that if Bangladesh is unable to ensure continuity of market access, the costs of LDC graduation for Bangladesh may be high. Bangladesh will face severe competition in export markets with economies such as Vietnam, India, Indonesia and China after graduation. Bangladesh should prepare a comprehensive transition strategy to ensure its export market access in the developed market can cope with the post-graduation environment. Bangladesh should try to ensure continued access to the EU market, a key export market. The GSP plus could be an option to ensure market access in the EU. Different preferential or free trade agreements with East Asian countries will also play a key role in integrating Bangladesh into the East Asian supply chain. The FTA strategy should be integrated into the national policy agenda, especially in the Fifth Five-Year Plan and the long-term Perspective Plan. Moreover, Bangladesh needs to play an active role in the WTO and UN LDC conference to ensure market access continues after graduation.

6.1. Future research

There are a number of areas in which the current research could usefully be developed. For example, similar research could be carried out for other graduating LDCs. A firm-level impact analysis would be very useful for providing detailed insights into employment distribution. Future work could also focus more explicitly on global supply chains, including how they affect the industrial composition of output, the occupational composition of employment, and the regional distribution of income in Bangladesh or other graduating LDCs. In addition, future studies could usefully focus on quantifying some potential benefits of LDC graduation that we do not model here, including an improved environment for foreign investment.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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