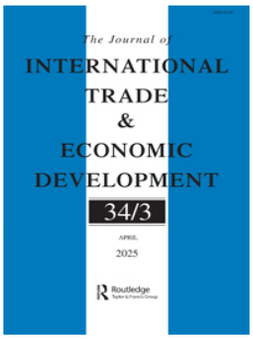

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The impact of LDC graduation on trade: A quantitative assessment

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ABSTRACT

Twelve Least-Developed Countries (LDCs) will graduate from the LDC status in the coming decade implying that they will lose preferential access to export markets. We quantify the expected impact of LDC graduation on exports of graduating and non-graduating LDCs incorporating detailed preference utilization data in a partial equilibrium model. We compare the results under actual and full preference utilization rates. Separately, we explore how underutilization of tariff preferences affects the exports of countries benefiting from such preferences. The analysis generates four main results. First, we project that graduation will have a negative impact on the exports of graduating LDCs (more than US$ 6 billion export loss or 6% of exports), especially in the clothing sector. Second, the adverse trade effects of graduation would be overestimated by 30% under full instead of actual utilization rates. Third, we show that the increase in exports of non-graduating LDCs following graduation of other LDCs is limited, implying that non-graduating poorer LDCs hardly benefit from graduation of richer LDCs. Fourth, we show that there would be significant benefits of increasing the utilization of LDC preferences. The exports of LDCs would increase by almost US$ 7 billions if they simultaneously switched to a full utilization regime.

KEYWORDS LDC graduation; tariff preferences; partial equilibrium model

JEL CLASSIFICATIONS F13, F17, O19

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1. Introduction

Trade preferences are a standard policy tool to foster the participation of Least Developed Countries (LDCs) in the world economy. Historically introduced to confront the negative effects of declining agricultural prices (Prebisch-Singer hypothesis), preferential duty schemes currently have the broader objective of assisting and facilitating the development of poorer nations by fostering exports and product diversification. A main stumbling block in achieving this objective is that trade preferences are typically underutilized (Keck and Lendle 2012). The literature tends to agree that using preferences entails a variety of administrative and bureaucratic costs, and exporters decide to rely on preferential duty schemes only if the gains from preference utilization exceed the

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costs, that are often substantial. Analyzing a sample of 12 Least Developed Countries, WTO (2020) shows that an average of 12% of exports entered preference-granting markets under LDC schemes in 2015–2016. Low utilization rates reflect both the presence of demand-side constraints (for instance, restrictive Rules of Origin, see Hayakawa, Kim, and Lee 2013) and supply-side penalizing factors, like limited export capacity and know-how, as well as bilateral heterogeneity in the costs of acquiring knowledge about the options (Cariola and Lanz 2022).

Low preference utilization has been often interpreted as a signal that trade preferences are not the most effective tool to address international development issues Persson (2015). However, recent econometric evidence seems to suggest the opposite. For instance, Frazer and Van Biesebroeck (2010) study the US African Growth and Opportunity Act (AGOA) and find that it had a large impact on US imports of apparel, agricultural and manufactured products from benefiting countries. Persson and Wilhelmsson (2007) , Gradeva and Martínez-Zarzoso (2016) and Scoppola, Raimondi, and Olper (2018) investigate the impact of the preferential schemes granted by the EU and find similar positive effects on the exports of beneficiaries. Moreover, Persson and Wilhelmsson (2016) show that trade preferences tend to increase the degree of product diversification of LDC exporters, while Ornelas and Ritel (2020) notice that the impact of preferences is larger for LDCs that are also WTO members, as WTO membership is usually associated with institutional reforms that facilitate the use of preferential schemes.

These relatively age-old issues recently re-emerged because, as countries develop, they graduate, meaning that they lose the status of LDC and the associated trade preferences. Following the last triennal review of the Committee for Development Policy (CDP) in 2018, the status of several LDCs was subject to a revision, and 12 of them are expected to graduate from the LDC status in the next decade (respectively Angola, Bangladesh, Bhutan, Kiribati, Lao PDR, Nepal, Myanmar, Sao Tome and Principe, Solomon Islandd, East Timor, Tuvalu and Vanuatu). The expectation is that the loss of LDC-specific preferences will cause a reduction in the exports of the graduating countries, although the underutilization of preferences will moderate this reduction. At the same time LDC graduation could provide more export opportunities of the remaining LDCs, given that LDCs tend to export similar types of products.

To explore the impact of LDC graduation and underutilization of preferences, we attempt to answer three main questions in this paper. First, we examine the expected impact of LDC graduation on the exports of graduating countries, taking into account that preference utilization is imperfect. Second, we explore how countries keeping LDC status are affected by graduation and whether a wider graduation would benefit the lowest income countries. Third, we quantify the extent to which low preference utilization reduces the participation of LDCs in the global economy, exploring a counterfactual scenario in which LDCs would fully use their preferences.

In order to answer these three questions, we employ a partial equilibrium model that allows us to simulate the impact of exogenous trade policy changes without information about domestic sales, which is not available for many of the graduating LDCs. The partial equilibrium model is an Armington model with product differentiation by country of origin and fixed aggregate demand and export supply elasticities. As most Argminton-like frameworks, our model induces trade shifting both on the importer and on the exporter side. For example, if the tariff rate on boys' T-shirts applied by the European Union to Bangladesh increases, the EU buyers will shift away from Bangladeshi

T-shirts, sourcing them from other countries, while Bangladeshi exporters will increase their exports towards third markets.

Although the partial equilibrium model in this paper is similar to existing partial equilibrium models such as SMART and GSIM, there are important differences. SMART (see for a description Jammes and Olarreaga 2005) is an Armington partial equilibrium model with import demand, export supply and substitution elasticities capturing both trade creation and diversion effects. Hence, SMART is based on an Armington framework like our model. However, the size of trade creation and trade diversion is calculated based on linear approximations neglecting trade shifting of exporters between different destination countries. GSIM (J. Francois and Hall 2003) is also based on an Armington framework and does solve for a global equilibrium. However, the maximum number of countries in GSIM is 25, while our model, coded in GAMS, solves for the exact solution after a shock, and the number of countries is flexible. Furthermore, it is easy to load in trade data for a large number of products and loop over these products.

Partial and general equilibrium models are a widely used tool to assess the impact of trade preferences. For example, Ianchovichina, Matoo, and Olarreaga (2002) use the 4th version of the GTAP model in order to assess the impact of US, EU, Canadian and Japanese preferences on the exports of 37 Sub-Saharan African countries. GTAP is a multi-country computational general equilibrium (CGE) model with perfect competition, constant returns to scale, constant difference of elasticities (CDE) preferences and product differentiation between domestic and imported goods and between imports by region of origin. Using this tool, Ianchovichina, Matoo, and Olarreaga (2002) simulate a variety of liberalization scenarios and find that unrestricted market access would increase the non-oil exports of Sub-Saharan African by 2.5 billion US$, especially to EU markets. This result is confirmed by UNCTAD (2001) and Somwaru and Trueblood (2002). These studies use the GTAP Version 5 model to project the potential benefits of increasing market access for LDCs through the EU Everything But Arms (EBA) initiative, projecting a significant increase in the exports of countries in Sub-Saharan Africa. Jensen and Yu (2005) use the same model to analyze the potential impact of EBA together with broader tariff cuts of the most-favored nation (MFN) duty rates, projecting that multilateral trade liberalizations would counterbalance the benefits coming from increased preferential market access. Cernat et al. (2003), on the other hand, study the welfare effect of increased preferential market access in Sub-Saharan Africa using both the GTAP and the UNCTAD-SMART model. Cernat et al. (2003) argue that the reason to use a partial equilibrium model in the analysis of preferences is that it allows a higher level of granularity at the product level, and indeed they project that the potential benefits of the EBA preference scheme would be concentrated in relatively few tariff lines (622). More recently, Cherkashin et al. (2015) build a Melitz-like model including firm heterogeneity and imperfect competition. Using customs data from the Bangladeshi apparel sector, they show that trade preferences can have positive spillover effects on the exports towards non-preference granting countries, as they increase the entry of new firms, thus boosting production.

Simulation studies have also been used to analyze the scope of preference erosion, i.e. the indirect loss of preference margin because of tariff reductions vis-a-vis all trading partners by importers granting preferences: multilateral tariff liberalizations consisting in a generalized reduction of MFN rates reduce the benefit of being eligible to preferential schemes relatively to competitors which export MFN. As noticed in Low, Piermartini, and Richtering (2009), the degree of preference utilization is crucial in quantifying the

impact of preference erosion. If preferences are not used, there is no preference erosion. J. Francois, Hoekman, and Manchin (2006) estimate that the administrative costs associated with preference utilization erode around 4 percentage points of preference margin. Using a CGE-model with monopolistic competition they show that potential preference erosion following the cut of the MFN tariffs in OECD countries is reduced if utilization rates are considered. Amiti and Romalis (2006), on the other hand, analyze preference erosion as a consequence of tariff liberalization in the US and the EU, and compute the effectively applied tariff for each tariff line either as the ratio between the value of collected duties and the total imports or as a weighted average of the MFN and preferential rates, where the weights depend on preference utilization. Their perfectly competitive partial equilibrium model projects that, given the low degree of preference utilization, the projected size of preference erosion is negligible.

In order to accurately estimate both the potential impact of LDC graduation and the potential benefits of full preference utilization, we incorporate the data on the utilization of LDC schemes into our model. Data on preferential duty schemes come from the WTO Preferential Trade Agreements (PTA) database, which has been assembled based on the Transparency Mechanism for Preferential Trade Arrangements (WT/L/806 of 14 December 2010).

We perform three distinct sets of simulations to answer our three main questions. First, we assess the potential impact of LDC graduation of the 12 graduating countries, simulating the expected increase in tariffs accounting for the initial utilization of LDC schemes. To show the importance of accounting for preferences, we also run the experiment assuming that LDC preferences were fully used.

In a second set of simulations we increase the group of graduating countries based on two scenarios: a moderate scenario in which all the countries satisfying at least one of the graduation criteria of the Committee for Development Policy (CDP) graduate and thus lose access to LDC preferences and a drastic scenario in which all LDCs graduate. This exercise sheds light on the importance of preferences for all LDCs and helps us to explore to what extent the lowest income LDCs would benefit from various levels of graduation.

In a third policy experiment we abstract from graduation focusing on the costs of underutilization of preferences and estimate the trade effects of raising the utilization rate of LDC preferences to 100%.

The results of our simulations confirm that trade preferences are an important tool for increasing the degree of market access of LDCs. We project that graduation will reduce the exports of LDCs by 6%, penalizing in particular the clothing sector in Bangladesh, which is currently characterized by a high degree of utilization of LDC schemes, especially for the trade flows directed towards the European Union. Other than Bangladesh, whose exports are projected to decrease by 14 percentage points, the most affected countries in our framework are Myanmar, (−4%, equal to almost US$ 0.5 billion) and Solomon Islands (−4%, equal to more than US$ 34 million). Furthermore, we show that taking into account preference utilization is important in the counterfactual. Without considering this issue, the aggregate impact of graduation on exports of the 12 graduating LDCs would be overestimated by 30%, with substantial heterogeneity at the exporter and sectoral level depending on how extensively LDC preferences are utilized.

We also analyze to what extent the lowest income LDCs, who keep LDC tariff preferences, can expand their exports when higher income LDCs lose preferential access

to developed markets. We call this phenomenon 'reverse preference erosion', since the preference margins of the lowest income LDCs will expand when other LDCs graduate. This expansion of export opportunities of the lowest income LDCs is a consequence of trade shifting of imports into markets granting preferences, i.e. developed countries' imports partially moving to the lowest income producers after tariffs from graduating LDCs increase. We find that the size of this effect is limited. This is partially due to the fact that graduating LDCs increasing their exports towards non preference granting countries leading to more competition in these markets and thus less export opportunities for the lowest income LDCs.

Extending the number of graduating countries, the second set of simulations, confirms that LDC-preferences are important also for the exporters that stand relatively behind on the way towards graduation: in particular, exporters from Cambodia, Comoros, Malawi and Mozambique would pay significantly higher tariffs if such schemes were removed. Furthermore, we find that the exports of the lowest income LDCs would rise about four times more if more LDCs are graduating (more reverse preference erosion). However, the percentage increase in exports would still be limited.

Our third set of simulations shows that a large part of the potential benefits from LDC preferences are not currently captured due to low utilization rates. Our model projects that, if trade preferences were fully used, the aggregate exports of LDCs would increase by 6920 US$ millions, representing around 4% of the total export value, with peaks in the Chemicals sector (+12%), Sugars and confectionery(+11%), Fruits, vegetables and plants (+8%) and Textiles (+8%). The countries that would benefit the most from full utilization as a share of their initial exports would be Bhutan (+27%), Tuvalu (+26%), Nepal (+20%) and Afghanistan (+11%); on the other hand, the largest export increases in absolute value would be in Cambodia (US$ 976,912), Bangladesh (US$ 935,405), Angola (US$ 825,828) and Myanmar (US$ 740,396).

With our study we make four contributions to the literature. First, we examine the impact of graduation of LDCs on trade patterns, taking a high level of detail of existing preference utilization into account. Second, we study the relevance of reverse preference erosion, so the extent to which the lowest income LDCs benefit from the lifting of tariff preferences of other developing and least-developed countries. Third, based on data about the utilization of preferences from the WTO PTA database, we are able to explore the potential benefits of a more extensive use of LDC preference schemes. Fourth, we introduce a tractable and parsimonious partial equilibrium model requiring only international trade data, which nevertheless incorporates trade shifting both on the importer and exporter side.

Our analysis generates three implications for development. First, taking the actual utilization of LDC preferences into account the expected impact of the planned graduation of 12 LDCs on exports is limited. The biggest effects can be found in clothing exports from Bangladesh. Second, the lowest income LDCs stand to gain little from graduation of the 12 LDCs. So, from a development perspective we do not find that richer LDCs should give up preferences to give more space in export markets to the lowest income LDCs and there seems to be no direct competition between LDCs in terms of access to developed country markets like for development aid funds for example. Third, the most sizeable benefits would come from full utilization of tariff preferences in LDCs, implying that efforts should be made to in order increase the utilization of preferences (for example, relaxing import-side constraints to preferential market access like Rules of Origin and other bureaucratic requirements).

The paper is organized as follows. The next section describes the maps out in detail the theoretical stricture of the model and the data sources that have been used to calibrate it and the channels of transmission of exogenous trade policy shocks. In Section 3, we will discuss the three sets of experiments (LDC graduation for 12 countries, extended graduation, full preference utilization) and present the results at different levels of aggregation. Section 4 concludes.

2. Model and data

2.1. Model

To analyze the effects of LDC graduation we employ a partial equilibrium model, i.e. a model in which every commodity is analyzed separately. We use a partial equilibrium model because it allows us to analyze the trade effects at a high level of disaggregation and because we do not have sufficient data to conduct a general equilibrium exercise. This would require data on domestic trade flows at the detailed sector level and data about the input-output structure, which are not available for most LDCs. The model allows for substitution between exports from different origin countries, but on the other hand does not allow for substitution between different products, which is the main difference with respect to a broader general equilibrium framework. Our model features two trade shifting effects: first, a tariff increase in market j targeted at exporter i makes it more attractive for the importer to source goods from other exporters; second, a tariff increase gives an incentive to exporter i to export more to other destination markets.

The following set of equilibrium equations formally defines the partial equilibrium Armington model for commodity k:

$$E_{jk}^{imp} = \kappa_{jk}^{imp}(P_{jk}^{imp})^{1-\epsilon_{jk}} \tag{1}$$

$$P_{jk}^{imp} = \left(\sum_i \omega_{ijk}^{\sigma_k}(p_{ik}(1+t_{ijk}))^{1-\sigma_k}\right)^{\frac{1}{1-\sigma_k}} \tag{2}$$

$$m_{ijk} = \omega_{ijk}^{\sigma_k}(p_{ik}(1+t_{ijk}))^{-\sigma_k}(P_{jk}^{imp})^{\sigma_k-1}E_{jk}^{imp} \tag{3}$$

$$x_{ik} = \lambda_{ik}p_{ik}^{\eta} \tag{4}$$

$$x_{ik} = \sum_j m_{ijk} \tag{5}$$

The value of import demand, E_{jk}^{imp}, in equation (1) is a negative function of the aggregate import price P_{jk}^{imp} with ϵ_{jk} the demand elasticity of aggregate import demand. All parameters in the model are positive, so ϵ_{jk} is the negative of the import demand elasticity. The aggregate import price, P_{jk}^{imp}, is defined in equation (2) as a weighted sum of the import prices from different sources, $p_{ik}(1+t_{ijk})$ with p_{ik} the sales price in region i and t_{ijk} the bilateral ad-valorem tariff rate. Equation (3) expresses that import demand m_{ijk} is a negative function of the import price $p_{ik}(1+t_{ijk})$ and a positive function of the aggregate import price P_{jk}^{imp} and expenditure E_{jk}^{imp}. σ_k is the elasticity of substitution between goods from different origin countries. Supply x_{ik} is a positive function of the sales price p_{ik} in equation (4) with η the elasticity of supply. As in most quantitative trade we abstract

from imperfect transformability of exports, assuming that there is only one sales price for all destinations, p_{ik}, instead of working with imperfect transformation on the export side. Equation (5) imposes equilibrium with supply x_{ik} equal to sales to different destinations. The parameters κ_{jk}^{imp}, ω_{ijk} and λ_{ik} are respectively aggregate import demand, bilateral import demand, and supply shifters used to calibrate baseline values to actual values in the data.

Because the analysis is partial equilibrium, it misses intersectoral general equilibrium effects: an increase in tariffs faced by an exporter because preferences are phased out, should lead to lower factor prices, making the exporter more competitive in other sectors. At the same time, the high level of disaggregation implies that trade shifting effects on the importer side are more precise. An increase in the import price from a specific source because tariffs are increasing leads only to a shift to other sources of supply for the detailed produce analyzed. In a typical general equilibrium analysis with more aggregate sectors, this trade shifting effect would be imprecise, since different products are aggregated in one sector. The alternative to embed a partial equilibrium trade structure in a general equilibrium model, as in the GTAP-HS model, is not feasible in our case because input-output data are lacking for most LDCs analyzed.

2.2. Data

Four inputs are needed to calibrate the model and run the policy experiments: cif-value of imports (exclusive of tariffs), baseline tariff rates, counterfactual tariff rates, and behavioral parameters. Import data are from Comtrade, using the Harmonized System 2012 classification at the 6-digit level level of aggregation; all the importers and exporters available are selected for the years 2016–2018 (excluding intra-EU trade) and, for each importer-exporter-product triple, the average value of trade over the 3-year time period is calculated to mitigate the influence of time-specific shocks.

Tariff data come either from UNCTAD-TRAINS or from the WTO PTA Database, which reports annual tariff and preference utilization data for 12 major preference granting members ,[1] allowing the computation of effectively applied rates based on the utilization of LDC preferences. Baseline and counterfactual tariffs are built employing two distinct methodologies, depending on the nature of the importer and the exporter. If the trade flow does not involve a shocked LDC and a preference granting member, the corresponding tariff is simply the effectively applied tariff from the UNCTAD-TRAINS database in 2016 for both the baseline and the counterfactual scenario. However, for transactions between a preference granting country and a shocked LDC, the baseline tariff is the weighted average of the available tariffs in 2016 (at the 6-digit level) with the weights given by the utilization rates of the different schemes, both MFN and preferential. We employ 2015–16 average in order to control for time-specific shocks and measurement errors. The utilization rate of the tariff scheme q is defined at the importer-exporter-product level as the ratio of the imports of product k originating from country i that enter market j using scheme q and the total trade of product k for the same importer-exporter couple.

Similarly, the counterfactual tariffs for trade between preference granting members and graduating LDCs is defined as follows:

(1) If the shock consists of a graduation exercise, the counterfactual tariff is obtained through the weighted average where the LDC duty rate is substituted with the best

alternative rate (usually GSP). Hence, we implicitly assume that, following graduation, the exporter starts using the best alternative scheme with the same utilization rate that characterized the LDC scheme;

(2) If the shock consists of the full use of LDC-specific preferences, the weighted average tariff rate is substituted with the LDC rate.

In practice, we integrate preference utilization in our model indirectly through the baseline and counterfactual effectively applied tariffs. This allows us to keep the theoretical framework parsimonious without loss of generality.

The model contains three behavioral parameters : the substitution elasticities between imports from different sources, σ_k, the price elasticity of aggregate import demand, ϵ_{jk}, and the elasticity of export supply, η. We set the values of these parameters based on the most recent empirical literature.

The substitution elasticities between imports from different sources, σ_k, are based on estimates at the six digit level in Fontagné, Guimbard, and Orefice (2019). These authors have exploited variation in bilateral applied tariffs for each six-digit product category for the universe of available country pairs in 2001–2016 to estimate the tariff elasticities. To avoid outliers in the estimated tariff elasticities to have a strong impact on the simulation results, we employ 4-digit level averages of the estimated tariff elasticities in Fontagné, Guimbard, and Orefice (2019).[2]

The price elasticity of aggregate import demand, ϵ_{jk}, is calibrated as follows, based on the assumption of a model with nested Armington preferences:

$$\epsilon_{jk} = \rho_k - (\rho_k - \nu_{jk}) sh_{jk}^{imp} \tag{6}$$

ρ_k is the substitution elasticity between domestic and importer goods, ν_{jk} is the price elasticity of total demand for product k in country j and sh_{jk}^{imp} is the share of imports in the total demand of a commodity k in country j. Like in most computable general equilibrium (CGE) models, we assume that the substitution elasticity between domestic and imported goods is half of the substitution elasticity between imports from different sources. Hence, we use $\rho_k = 0.5\sigma_k$ with σ_k the substitution elasticities between imports from different sources based on Fontagné, Guimbard, and Orefice (2019) as described in the previous paragraph. To obtain values for sh_{jk}^{imp} and ν_{jk}, we use data from the GTAP10 database. The estimates for ν_{jk} in the GTAP database are typically smaller than 1, which we deem preferable over assuming simple Cobb-Douglas preferences for sectoral demand.

By defining ϵ_{jk} as a function of σ_k through the substitution elasticity between domestic and imported goods, we can ensure that the aggregate import demand elasticity is smaller than the substitution elasticity, $\epsilon_{jk} < \sigma_k$. If this were not the case, we could run into the paradox that an increase in the export price of exporter i in market j decreases the imports of j from alternative sourcing countries, because the fall in total import demand due to the price increase would be stronger than the substitution effect between different sourcing countries.[3]

Finally, the price elasticity of export supply, η, is set at 7.7, based on the latest handbook chapter on trade elasticities (Hillberry and Hummels 2013).

2.3. The channels of transmission of trade policy shocks

Before turning to the policy experiments, it is useful to elaborate on the channels through which a tariff shock can impact the trade flows in our simple partial equilibrium model. We can distinguish between three channels present in our model: a direct price effect, a price competitiveness effect, and an export competitiveness effect. To identify these effects in the model we substitute equations (1) and (2) into equation (3) gives:

$$m_{ijk} = \omega_{ijk}^{\sigma_k} \kappa_{jk}^{imp} \frac{P_{jk}^{\sigma_k - \epsilon_{jk}}}{(p_{ik}(1+t_{ijk}))^{\sigma_k}} \tag{7}$$

Assuming that the income and total import demand is unchanged following the policy shocks, hat differentiating this equation enables us to identify the three channels through which tariffs affect import demand:

$$\widehat{m}_{ijk} = - \underbrace{\sigma_k \widehat{1+t_{ijk}}}_{\text{Substitution effect}} + \underbrace{\left(\sigma_k - \epsilon_{jk}\right)\widehat{P}_{jk}}_{\text{Import competitiveness}} - \underbrace{\sigma_k \widehat{p}_{ik}}_{\text{Export competitiveness}} \tag{8}$$

A change in bilateral tariffs affects import demand through a substitution effect. Higher bilateral tariffs reduce import demand, because the importing country will substitute to other sources of supply. The change in tariffs also affects import demand through a change in import competitiveness. Higher import tariffs also raise the average price level in an importing market, which makes it easier to compete for exporters in this market. Finally, export competitiveness is affected by changes in tariffs. A rise in tariffs faced by an exporter leads to lower demand for its products, which in turn reduces its export price. This makes it easier to compete for the exporter.

Next, we are more precise and discuss the three cases of changes in bilateral tariffs between country i and j on trade between country i and j and the impact of changes in bilateral tariffs between country l and j and country i and m on trade between country i and j. For the first relation all three channels are operative. For the second and third relation respectively only import competitiveness and export competitiveness are operative.

We start with the first relation, between tariffs between country i and j and trade between and i and j. The first channel is a substitution effect: an increase in bilateral tariffs t_{ijk} decreases exports from country i to country j, because the importing country will substitute towards other exporting countries. The size of this substitution rises with the size of the substitution elasticity σ_k: with a higher σ_k consumers will switch more to other sources of supply.

The second channel is an import competitiveness effect. An increase in t_{ijk} also increases the average price level in importer j, which raises imports from all sourcing countries, so also from country i. However, this indirect positive effect through the average price level is dominated by the direct negative effect. This can be seen by hat differentiating the expression for P_{jk} in equation (2):

$$\widehat{P}_{jk} = \sum_l sh_{ljk}^{imp} \left(\widehat{1+t_{ljk}} + \widehat{p}_{lk}\right) \tag{9}$$

Equation (9) shows that the impact of higher tariff t_{ijk} on P_{jk} is scaled down by the import share sh_{ljk}^{imp}. Hence, the indirect impact of a higher t_{ijk} through import competitiveness is

smaller than the direct substitution effect. The indirect effect is further reduced, because the coefficient on $\widehat{P_{jk}}$ in equation (8) is equal to $\sigma_k - \varepsilon_k$. The negative impact through ε_k is an aggregate demand effect. A higher price level P_{jk} reduces expenditures on sector k, E_{jk}, moderating the increase in P_{jk}.

The third channel is an export competitiveness effect. An increase in t_{ijk} reduces demand for goods from exporter i, thus driving down the export price of goods produced by country i. This moderates the direct substitution effect. More formally the export competitiveness effect can be derived by combining equations (3) and (5) into (4), to generate the following implicit expression for the export price p_{ik}:

$$\lambda_{ik} p_{ik}^{\eta} = \sum_{m} \omega_{imk}^{\sigma_k} \left(p_{ik}(1 + t_{imk})\right)^{-\sigma_k} \left(P_{mk}^{imp}\right)^{\sigma_k - \epsilon_{mk}} \kappa_{mk}^{imp} \tag{10}$$

Hat differentiating equation (10) and reorganizing leads to:

$$\widehat{p}_{ik} = -\frac{1}{\eta + \sigma_k} \sum_{l} sh_{ilk}^{\exp} \left(\sigma_k \widehat{1 + t}_{njk} - (\sigma_k - \epsilon_{lk}) \widehat{P}_{lk}^{imp}\right) \tag{11}$$

Equation (11) shows that the change in the tariff t_{ijk}, is premultiplied by the share of country j in exports and by one divided by the export supply elasticity plus the substitution elasticity. Therefore, direct substitution effect dominates the indirect effect through export competitiveness.

Next, we turn to the impact of a change in tariffs between country l and j on trade between country i and j. This effect runs through changes in import competitiveness. An increase in t_{ljk} makes imports from regions l more expensive, thus raising the average price level P_{jk} in country j and reducing the import competitiveness. Therefore, country i will be able to export more. This effect is similar to the concept of 'preference erosion' (see for example J. Francois, Hoekman, and Manchin (2006)), which was extensively studied after the Doha round because of the concern that multilateral tariff reductions could adversely affect the degree of market access of developing countries. In the case of graduation of tariff preferences, some countries will lose preferences and will have to pay higher tariffs. Therefore, there will be 'negative trade erosion': the lowest income LDCs maintaining preferences will face less competition in destination markets and will therefore be able to export more. In the section reporting the results, we will explore the quantitative importance of this effect and also how it depends on the number of countries graduating.

Finally, we address the impact of a change in tariffs between country i and m on trade between country i and j. This effect runs through changes in export competitiveness. An increase in t_{imk} will reduce the demand for exports from country i. As a result, the export price of country i will fall. This will improve its export competitiveness. Thus, country i will be able to export more to country j. Hence, this is a trade shifting effect on the export side: when tariffs to a specific destination market m increase, a country will be able to export more to other countries j.

Since we are working with a partial equilibrium framework, our model is not able to capture trade shifting through intersectoral linkages. Because each sector is analyzed separately, there are no feedback effects between sectors. Such feedback effects could be theoretically relevant: for instance, a reduction in export opportunities to countries

withdrawing LDC preferences on specific products will in principle reduce the price of inputs in all sectors and thus lead to more exports of other products. The best way to avoid this omission would be to include spillover effects between sectors, but this would require a general equilibrium model and most importantly additional data on the input-output production structure of the graduating LDCs. However, this information is not available for most of the graduating countries studied.

An alternative would be to conduct analysis with the partial equilibrium model at a higher level of aggregation. In this way, for instance, a reduction in export opportunities to countries withdrawing preferences for LDCs would lead directly to a fall in the price of inputs of graduating LDCs and thus make these countries more competitive in their exports to third regions in more aggregate sectors. However, there is an important disadvantage of this approach: the modeling of trade diversion on the import side will become less accurate. With more aggregate sectors a reduction in imports of an aggregate product (for example Oilseeds, fats, and oils) from a country facing higher tariffs will lead directly to more imports from other exporters, whereas the LDC and the third country might produce very different detailed products within the aggregate product and are thus not competing directly in the detailed product. For example, suppose that the LDC exports Oilseeds and the third country Fats. The model could predict that a third country starts exporting more Oilseeds, fats and oils in response to higher tariffs only on Oilseeds, whereas the third country actually does not export any Oilseeds and only Fats. Therefore, we have decided to conduct our analysis at the highest level of disaggregation with available trade data, HS6.

Another limitation of the employed model is that only intensive margin adjustments of trade are considered, meaning that tariff changes exclusively affect positive trade flows and have no impact on trade flows which are initially zero in the data. This might lead to an overestimation of the impact of positive tariff shocks like LDC graduation, because LDCs facing higher tariffs with preference granting countries might expand their exports to new products and destinations in order to partially compensate the loss of market access, as in the competition channel. However, for the application in the paper, an increase in tariff rates because of graduation only reduces import demand and thus would turn some initially positive trade flows to zero following the tariff change; this channel is already operative in our model. In practice, the main advantage of taking into account the extensive margin of trade would be a reduction of the estimated effect of LDC graduation through an increase in the importance of the competition effect. Despite being interesting, this extension would require to model and calibrate fixed costs of exporting in a heterogeneous firms model with an upper bound to the productivity distribution as in Helpman, Melitz, and Rubinstein (2008), which does not lend itself for large scale quantitative implementation.

3. Policy experiments

We conduct three sets of policy experiments. The first set of simulations concerns LDC graduation. The main change following graduation will be that graduated countries, after possible transition periods, will be no longer eligible to LDC-specific preferential duty schemes, which means in turn that the fraction of their exports that currently benefits from such schemes might pay higher tariffs to enter foreign markets.

There are three mitigating factors to consider in this regard. The first one is that a significant fraction of the exports of graduating LDCs already can already enter preference

granting markets MFN duty free. Secondly, graduating LDCs are often eligible to alternative duty schemes that grant them a favorable degree of market access independently of LDC specific preferences. Finally, even if alternative duty schemes are not available and the MFN rate is greater than zero, the utilization rate of the LDC schemes tends to be low.[4]

We take these mitigating factors into account in our experiments by computing the effectively applied rate as a weighted average of the available rates with the weights given by the utilization rates of the different preferential duty schemes. In order to show how the limited utilization of the LDC schemes contributes to lower the impact of graduation, we also build an alternative scenario where the utilization of the LDC scheme is assumed to be full, and we show that the reduction in the size of exports would be much more substantial if this were the case.

In the second set of simulations we raise the group of graduating LDCs to simulate how graduation would affect trade patterns in the medium to long run. In a first experiment we extend the set of graduating countries by including also the LDCs that partially satisfied the graduation requirements during the 2018 triennal review of the Commitment for Development Policy. The CDP initiates the graduation process if a country satisfies two out of three criteria (GNI per capita, human assets index and economic vulnerability index) in two consecutive triennial reviews. Other than the graduating LDCs, 14 countries satisfied one out of three criteria in 2018, namely Cambodia, Comoros, Democratic Republic of the Congo, Djibouti, Guinea, Haiti, Lesotho, Mauritania, South Sudan, Sudan, Togo, Uganda, Tanzania and Zambia. We assume that these countries will graduate next in the medium run, along with the LDCs that are currently expected to graduate, and examine in particular how this would affect the LDCs that have not yet fulfilled any graduation criteria. After this experiment, we run a long-run scenario in which we assume that all 47 LDCs lose the access to LDC-specific duty rates in order to show which of them currently benefit the most from LDC duty schemes.

Finally, in the last set of simulations we assume that all the obstacles to preference utilization are simultaneously removed, and all LDCs switch from the current effectively applied rate to a scenario in which they would fully use LDC preferences. This exercise will show what would be the advantage of relaxing the constraints to the utilization of preferential duty schemes, which exporters would benefit the most from it, and which sectors would see the highest tariff reductions and export increases.

There is a wide literature on the determinants of the underutilization of preferences (see, for example, Keck and Lendle (2012)), which is dependent on importer and exporter specific factors as well as bilateral heterogeneity. The costs of preference utilization have been mainly explained with the difficulties related to the compliance with Rules of Origin (ROOs) and other bureaucratic requirements, while the benefits are associated with the fact that the preferential duty rate is usually lower than the MFN (and sometimes the alternative preferential) rate. The choice of using preferences is made by comparing the benefits of preference utilization, which are increasing in the export volume, and the relative costs, which are often fixed and significant. Our full preference utilization scenario implicitly assumes that the compliance costs would be negligible with respect to the benefits, which is a big assumption. Nevertheless, our simulations contain useful information about the advantages of removing the compliance costs, identifying the countries and sectors that would benefit most from it.

4. Summary statistics

Columns 1 and 2 of Table 1 report the trade weighted average tariff before graduation for each LDC, column 3 reports the average tariff after graduation, while columns 4 and 5 report the export share of each country, respectively as a share of the total imports of preference granting countries and as a share of world imports.

Two main pieces of information can be inferred from this table. First of all, the weighted average tariff with full utilization is substantially lower than the tariff with partial utilization, meaning that most LDCs are not fully benefiting from the advantages of preferential market access. Secondly, LDCs represente a relatively small fraction of global trade: all of them present export shares below 1% (see columns 4 and 5 of Table 1), and most of them represents less than 0.1% of the world trade, with the exception of Bangladesh (0.29%), Angola (0.28%), Cambodia (0.14%) and Myanmar (0.10%). According to Comtrade data, LDCs present relatively low export shares in all sectors (the only remarkable exception is Bangladesh, whose exports in textiles and clothing represent around 5% of the world trade). For this reason, the import competitiveness effect described in equation (9) is expected to be small.

5. Results

In this section we present the results of the simulations with our partial equilibrium model, first describing the simulated effect of graduation of 12 LDCs with and without considering initial preference utilization, then going into the effects of a larger group of graduating countries, and finally mapping out the projected effects of full preference utilization.

5.1. Graduation of 12 LDCs

Table 2 displays the impact of graduation for the 12 LDCs that are currently expected to graduate, both employing actual utilization rates and assuming full utilization of preferences. The table shows initial exports and the change in exports (both in thousands of dollars), the change in exports as per cent of initial exports, and the change in applied tariffs for both scenarios.

If the utilization rates of the LDC schemes are taken into account, the country which displays the highest loss from graduation is Bangladesh, as it is the one that is projected to face the highest increase in the applied tariff. This is mainly due to the fact that Bangladesh's utilization rate of the LDC scheme is high especially in the European Union, which is its main destination market. It is followed by Myanmar, Solomon Islands, Nepal, Bhutan and Lao PDR.

Assuming that the initial utilization of the LDC schemes would be 100%, Bangladesh is still the country with the highest export loss in absolute value. However, the projected reduction in exports as a per cent of initial exports would be larger for Bhutan and Nepal. Furthermore, the difference between the partial and full utilization scenario is much larger for these countries. For instance, Bhutan is projected to lose only 2% of the initial exports under the partial utilization scenario, while the loss would be as high as 27% if the LDC preferences were fully used; similarly, the export loss would be 21% instead of 2% for Nepal and 19% instead of approximately 0% for Tuvalu.

Table 1. Summary statistics.

	Initial tariff			Share of imports	
	(partial util.)	(full util.)	Final tariff	(pref. grant.)	(world)
Afghanistan	0.16	0.00	0.32	0.01	0.01
Angola	0.00	0.00	0.00	0.34	0.28
Bangladesh	0.02	0.00	0.09	0.37	0.29
Benin	0.03	0.00	0.05	0.01	0.01
Bhutan	0.01	0.00	0.08	0.00	0.00
Burkina Faso	0.01	0.00	0.03	0.02	0.02
Burundi	0.00	0.00	0.02	0.00	0.00
Cambodia	0.03	0.00	0.11	0.16	0.14
Central African Republic	0.01	0.00	0.02	0.00	0.00
Chad	0.00	0.00	0.00	0.02	0.01
Comoros	0.02	0.00	0.16	0.00	0.00
Congo. Dem. Rep.	0.01	0.00	0.02	0.10	0.07
Djibouti	0.02	0.00	0.06	0.00	0.00
East Timor	0.00	0.00	0.01	0.00	0.00
Eritrea	0.00	0.00	0.01	0.00	0.00
Ethiopia	0.02	0.00	0.06	0.02	0.02
Guinea	0.00	0.00	0.01	0.03	0.04
Guinea-Bissau	0.00	0.00	0.00	0.00	0.00
Haiti	0.12	0.00	0.13	0.01	0.01
Kiribati	0.01	0.00	0.01	0.00	0.00
Lao PDR	0.04	0.00	0.06	0.05	0.03
Lesotho	0.01	0.00	0.02	0.01	0.01
Liberia	0.00	0.00	0.00	0.01	0.01
Madagascar	0.00	0.00	0.03	0.03	0.03
Malawi	0.04	0.00	0.15	0.01	0.01
Mali	0.00	0.00	0.02	0.01	0.02
Mauritania	0.00	0.00	0.02	0.02	0.02
Mozambique	0.00	0.00	0.03	0.05	0.05
Myanmar	0.01	0.00	0.05	0.13	0.10
Nepal	0.06	0.00	0.14	0.01	0.01
Niger	0.00	0.00	0.03	0.00	0.01
Rwanda	0.00	0.00	0.01	0.00	0.01
Sao Tome and Principe	0.00	0.00	0.01	0.00	0.00
Senegal	0.00	0.00	0.04	0.02	0.03
Sierra Leone	0.00	0.00	0.01	0.01	0.01
Solomon Islands	0.00	0.00	0.02	0.01	0.01
Somalia	0.05	0.00	0.08	0.00	0.00
South Sudan	0.00	0.00	0.00	0.02	0.01
Sudan	0.01	0.00	0.03	0.05	0.03
Tanzania	0.00	0.00	0.05	0.03	0.04
The Gambia	0.00	0.00	0.01	0.00	0.00
Togo	0.02	0.00	0.05	0.01	0.03
Tuvalu	0.00	0.00	0.07	0.00	0.00
Uganda	0.03	0.00	0.05	0.01	0.02
Vanuatu	0.01	0.00	0.03	0.00	0.00
Yemen	0.00	0.00	0.01	0.01	0.01
Zambia	0.00	0.00	0.03	0.05	0.06

Notes: The second and third columns report the initial average tariffs with partial and full utilization of the LDC schemes, the third column reports the final average tariff assuming that the LDC duty scheme is substituted with the best alternative rate, the fourth and fifth columns report national exports as a share of the total imports of the preference-granting members and the world (2016–2018 average).

In practice, the fact that preference utilization is less than full for most LDCs (and close to zero in a few cases) is *per se* a mitigating factor that reduces the negative impacts of the graduation from the LDC category. Our calculations show that it is crucial to consider initial preference utilization to make a correct assessment of the impact of

Table 2. Export and tariff change graduating LDCs, assuming both partial and full preference utilization.

		Partial utilization			Full utilization		
Exporter	Initial exp. US$,000	Exp. change US$,000	Percentage change	Eff. tariff change	Exp. change US$,000	Percentage change	Eff. tariff change
Angola	36,694,340	−25,977	0.00	0.02	−350,341	−0.01	0.26
Bangladesh	37,633,733	−5,372,738	−0.14	5.73	−6,087,255	−0.16	6.50
Bhutan	295,867	−4,251	−0.01	0.26	−80,361	−0.27	6.84
East Timor	123,038	−42	0.00	0.01	−2544	−0.02	0.70
Kiribati	153,730	−299	0.00	0.06	−1286	−0.01	0.26
Lao PDR	4,581,917	−66,317	−0.01	0.65	−225,829	−0.05	2.21
Myanmar	13,028,355	−499,157	−0.04	1.75	−1,093,929	−0.08	3.47
Nepal	812,796	−20,140	−0.02	0.90	−168,245	−0.21	7.90
Sao Tome and Principe	16,043	−14	0.00	0.03	−177	−0.01	0.30
Solomon Islands	826,170	−34,399	−0.04	1.35	−52,478	−0.06	1.89
Tuvalu	58,623	−5	0.00	0.00	−10,955	−0.19	5.77
Vanuatu	293,961	−864	0.00	0.14	−11,767	−0.04	1.42
Total	94,518,575	−6,024,202	−0.06	2.58	−8,085,167	−0.09	3.39

Notes: The second column reports the initial export value of each graduating LDC, columns 3 to 5 respectively report the simple export change, the percentage export change and the effective tariff change following graduation assuming the partial utilization of LDC preferences and columns 6 to 8 report the simple export change, the percentage export change and the effective tariff change following graduation assuming the full utilization of LDC preferences.

Table 3. Trade diversion by graduating LDC.

			Partial utilization			Full utilization		
Exporter	Destination	Initial exp. US$,000	Exp. change US$,000	Percentage change	Eff. tariff change	Exp. change US$,000	Percentage change	Eff. tariff change
Angola	Effective change	28,372,173	−42,960	0.00	0.02	−646,402	−0.02	0.30
	Other	8,322,166	16,983	0.00	0.00	296,060	0.06	0.00
Bangladesh	Effective change	27,320,608	−6,199,333	−0.23	7.90	−6,957,153	−0.25	8.73
	Other	10,313,125	826,595	0.08	0.00	869,898	0.09	0.00
Bhutan	Effective change	280,743	−4435	−0.02	0.28	−83,461	−0.30	7.16
	Other	15,125	185	0.01	0.00	3100	0.23	0.00
East Timor	Effective change	33,201	−48	0.00	0.04	−2598	−0.03	1.16
	Other	89,837	6	0.00	0.00	54	0.00	0.00
Kiribati	Effective change	17,356	−309	−0.02	0.50	−1383	−0.01	0.38
	Other	136,374	11	0.00	0.00	96	0.00	0.00
Lao People's Democratic Republic	Effective change	591,105	−73,521	−0.12	5.01	−263,977	−0.08	3.31
	Other	3,990,812	7,204	0.00	0.00	38,148	0.02	0.00
Myanmar	Effective change	11,638,438	−543,378	−0.05	1.96	−1,205,711	−0.10	3.87
	Other	1,389,917	44,221	0.03	0.00	111,783	0.08	0.00
Nepal	Effective change	773,764	−20,922	−0.03	0.95	−170,036	−0.22	8.22
	Other	39,032	782	0.02	0.00	1791	0.06	0.00
Sao Tome and Principe	Effective change	8644	−15	0.00	0.06	−194	−0.02	0.46
	Other	7399	0	0.00	0.00	17	0.00	0.00
Solomon Islands	Effective change	174,828	−37,003	−0.21	6.40	−78,394	−0.34	6.75
	Other	651,343	2,603	0.00	0.00	25,916	0.04	0.00
Tuvalu	Effective change	45,274	−5	0.00	0.00	−10,992	−0.23	7.04
	Other	13,349	1	0.00	0.00	38	0.00	0.00
Vanuatu	Effective change	109,532	−1,050	−0.01	0.38	−12,042	−0.09	3.05
	Other	184,429	185	0.00	0.00	255	0.00	0.00
Total	Effective change	69,365,666	−6,922,979	−0.10	3.52	−9,432,323	−0.12	3.10
	Other	25,152,908	898,776	0.04	0.00	1,347,156	0.07	0.00

Notes: For each graduating country, the table reports the initial export value, export and tariff changes in preference-granting countries where LDC graduation is projected to lead to an increase in tariffs ('Effective change' rows) and in the other countries ('Other'). Specifically, the second column reports the initial export value of each graduating LDC, columns 3 to 5 respectively report the simple export change, the percentage export change and the effective tariff change following graduation assuming the partial utilization of LDC preferences and columns 6 to 8 report the simple export change, the percentage export change and the effective tariff change following graduation assuming the full utilization of LDC preferences.

graduation of LDC preferences. The possibility to shift exports to other markets, moderates the impact of graduation. As explained in Section 2.3, the decrease in exports following graduation raises the export competitiveness of graduating countries by lowering the export prices of graduating LDCs, making them more competitive, other things being equal, in non preference granting countries. This is shown in Table 3, which decomposes the projected export changes of graduating countries into changes in exports to preference granting members and to other markets. The decrease in exports towards preference granting members is partially compensated by the increase in export competitiveness and thus the increase in exports towards third economies. The size of this effect depends on the trade loss following graduation and the specific characteristics of the third markets. For instance, if all LDCs tend to redirect their exports towards the same market the moderating effect of trade shifting on export losses would be limited due to the high degree of competition. Bangladesh, for example, would experience a 23% decrease in exports following graduation if the trade diversion mechanism were not in place, but such drop is mitigated by an increase in exports of more than 800 million dollars towards markets which did not see an increase in the tariff rates. As before, the magnitude of the projected export changes (both in markets with an effective tariff change and in other destinations) is bigger if we assume the full utilization of preferences, as the tariff shock is more pronounced. Because of changes in import and export competitiveness, trade policy shocks can have a substantial indirect impact on third countries, i.e. those countries where the tariffs do not change following graduation. Table 4 displays initial exports and projected export changes (both in values and percentages), under the partial and the full utilization scenario. LDCs are presented individually, while the other countries are aggregated into regions according to the WTO and World Bank classifications.

There are two competing forces at stake: reverse preference erosion tends increase the exports of third countries, as the change in relative price makes graduating LDCs less competitive, while trade shifting on the exporter side tends to increase the competition in non preference granting destination markets and thus has the opposite effect. In general, it appears that LDC graduation has a positive impact on the exports non graduating LDCs, which is magnified when full preference utilization is assumed. Nevertheless, the only country that is projected to significantly benefit from LDC graduation is Cambodia, whose exports are predicted to increase by more than US$ 306 million (2% of the initial exports), mainly because it is specialized in the clothing sector and one of its main competitors (Bangladesh) will be negatively affected from graduation[5]; the export increase for the other LDCs is projected to be relatively small (less than 1%). A few countries display small export decreases following graduation due to the higher degree of export competitiveness. Moreover, the sign of the export change can vary depending on the assumption on the utilization of preferences. For example, Zambia is projected to increase its exports by us$ 171 thousands in the partial utilization scenario, and to decrease them by US$ 145 in case of full utilization. The difference is mainly driven by product 740,311 (refined copper cathodes), which Zambia exports to Thailand. The issue is that Myanmar exports the same product both to Thailand and China and, following graduation, loses preferential access to the Chinese market. The preference utilization rate for this product in the Chinese market is low, so the trade shifting is negligible if the utilization rate is taken into account but, under the full utilization scenario, it becomes substantial, making the market more competitive and penalizing the exporters from Zambia. Also for other exporters, the sign of the export change depends on the balance

Table 4. Export and tariff change other exporters, assuming both partial and full preference utilization.

		Partial utilization		Full utilization	
Exporter	Initial exp. US$,000	Exp. change US$,000	Percentage change	Exp. change US$,000	Percentage change
Afghanistan	1,196,480	31	0.00	1499	0.00
Benin	1,308,767	4	0.00	192	0.00
Burkina Faso	2,576,107	1	0.00	−13	0.00
Burundi	203,348	−1	0.00	53	0.00
Cambodia	17,999,506	306,798	0.00	344,845	0.00
Central African Republic	165,877	0	0.00	27	0.00
Chad	1,765,591	0	0.00	23	0.00
Comoros	111,233	5	0.00	14	0.00
Congo, Dem. Rep.	9,077,785	4	0.00	20	0.00
Djibouti	139,342	24	0.00	106	0.00
Eritrea	503,331	159	0.00	260	0.00
Ethiopia	2,746,401	3,697	0.00	5036	0.00
Guinea	5,609,436	2	0.00	113	0.00
Guinea-Bissau	354,711	−1	0.00	6	0.00
Haiti	1,203,148	4380	0.00	4551	0.00
Lesotho	1,193,174	1220	0.00	1238	0.00
Liberia	1,860,261	0	0.00	91	0.00
Madagascar	3,569,929	14,725	0.00	15,880	0.00
Malawi	993,336	1320	0.00	2495	0.00
Mali	2,459,324	32	0.00	161	0.00
Mauritania	2,780,415	171	0.00	260	0.00
Mozambique	6,337,377	1289	0.00	7010	0.00
Niger	737,645	86	0.00	439	0.00
Rwanda	706,440	95	0.00	168	0.00
Senegal	3,558,764	656	0.00	793	0.00
Sierra Leone	864,643	32	0.00	−50	0.00
Somalia	579,151	−9	0.00	11	0.00
South Sudan	1,579,478	1	0.00	65	0.00
Sudan	4,476,447	569	0.00	3165	0.00
Tanzania	5,374,605	859	0.00	7421	0.00
The Gambia	202,951	11	0.00	−83	0.00
Togo	3,411,862	77	0.00	307	0.00
Uganda	2,438,733	194	0.00	822	0.00
Yemen	1,885,550	95	0.00	124	0.00
Zambia	7,631,890	171	0.00	−145	0.00
Total LDCs	97,603,038	336,697	0.00	396,906	0.00
Africa	381,014,206	341,883	0.00	391,023	0.00
America	2,861,879,577	165,630	0.00	231,316	0.00
Asia	5,393,628,116	2,047,161	0.00	2,417,710	0.00
CIS	522,881,958	36,042	0.00	58,880	0.00
Europe	2,628,682,171	802,386	0.00	966,869	0.00
Middle East	816,152,775	21,715	0.00	123,050	0.00
Pacific	2,663,651	757	0.00	2106	0.00
South Asia	309,629,901	742,613	0.00	786,724	0.00
Total other exporters	12,916,532,356	4,158,186	0.00	4,977,677	0.00

Notes: The second column reports the initial export value of each non graduating country (both LDCs and non LDCs), columns 3 to 5 respectively report the simple export change, the percentage export change and the effective tariff change following graduation in the partial utilization scenario and columns 6 to 8 report the simple export change, the percentage export change and the effective tariff change following graduation in the full utilization scenario. LDCs are presented individually, non LDCs are aggregated into WTO-World Bank regions.

between preference erosion and export competition, that are in turn influenced by the assumptions on the utilization of preferences.

Table 5 shows the initial exports, the change in exports and the change in applied tariffs by product according to the multilateral trade negotiations (MTN) classification,

Table 5. Export and tariff change in graduating LDCs by MTN sector.

		Partial utilization			Full utilization		
Product	Initial exp. US$,000	Exp. change US$,000	Percentage change	Eff. tariff change	Exp. change US$,000	Percentage change	Eff. tariff change
Animal products	76,425	−746	−0.01	0.53	−11,392	−0.15	4.90
Beverages and tobacco	290,540	−13,924	−0.05	2.72	−70,823	−0.24	12.14
Cereals and preparations	616,686	−73,315	−0.12	5.71	−90,940	−0.15	7.65
Chemicals	559,727	−7482	−0.01	0.29	−68,105	−0.12	3.01
Clothing	35,373,816	−5,257,303	−0.15	6.15	−5,779,865	−0.16	6.83
Coffee, tea	134,370	−175	0.00	0.04	−983	−0.01	0.30
Cotton	12,336	0	0.00	0.00	−7	0.00	0.04
Dairy products	4716	−395	−0.08	2.90	−1591	−0.33	14.19
Electrical machinery	834,990	−282	0.00	0.01	−22,006	−0.03	0.77
Fish and fish products	1,603,632	−163,623	−0.10	2.70	−223,858	−0.14	4.02
Fruits, vegetables, plants	1,268,737	−6262	0.00	0.16	−235,008	−0.17	8.71
Leather, footwear, etc	2,052,507	−230,731	−0.11	4.25	−287,411	−0.14	5.24
Manufactures n.e.s.	1,761,105	−1274	0.00	0.02	−44,113	−0.03	0.88
Minerals and metals	11,720,975	−26,218	0.00	0.06	−565,824	−0.05	1.26
Non-electrical machinery	346,145	−82	0.00	0.01	−11,252	−0.03	0.94
Oilseeds, fats and oils	261,014	−3008	−0.01	0.26	−43,703	−0.17	6.49
Other agricultural products	218,043	−1062	0.00	0.17	−32,604	−0.15	7.93
Petroleum	31,991,615	−20	0.00	0.00	−17,906	0.00	0.01
Sugars and confectionery	64,896	−8849	−0.14	9.50	−15,505	−0.24	22.26
Textiles	2,905,817	−196,946	−0.07	2.26	−358,499	−0.12	4.23
Transport equipment	801,347	−30,313	−0.04	0.94	−75,330	−0.09	2.58
Wood, paper, etc	1,619,134	−2192	0.00	0.04	−103,554	−0.06	1.72
Total	94,518,575	−6,024,202	−0.06	2.58	−8,085,167	−0.09	3.39

Notes: The second column reports the initial export value of each MTN sector in graduating LDCs, columns 3 to 5 respectively report the simple export change, the percentage export change and the effective tariff change following graduation assuming the partial utilization of LDC preferences and columns 6 to 8 report the simple export change, the percentage export change and the effective tariff change following graduation assuming the full utilization of LDC preferences.

both for partial and full preference utilization. In both cases, the sector which drives the aggregate results is clothing, which is the main export sector of Bangladesh and whose export reduction is projected to account for more than 5 billion dollars. It is followed by leather and footwear (230 millions US$ loss) and textiles (196 millions US$). The product with the lowest export decrease is cotton, which is projected not to experience any tariff increase under the partial utilization scenario.

Since clothing accounts for 37% of the exports of graduating LDCs towards preference granting members and 87% of the total trade loss following graduation, it is worth to explore what drives this result. Table 6 disaggregates the initial exports as well as export and tariff change by importer: the European Union, which is the main destination market for graduating LDCs, is also characterized by the biggest loss (more than US$ 5 billion, equal to 26% of the initial exports), followed by Canada (US$ 484 million, 42% of the initial trade) and Japan (US$ 263 million, 15% of the initial trade) and Korea (US$ 125 million, 21% of the initial trade). These four preference granting members are also the countries with the largest erosion of the preference margin following graduation: the average tariff rate in the clothing sector is expected to respectively increase by 9.14, 14.85, 5.00 and 6.43 percentage points. The export decrease in these markets is partially compensated by trade shifting towards the countries and regions where the clothing sector is not expected to face a tariff increase following graduation, in particular the United States, where the imports of clothing from the graduating countries are projected to increase by 408 US$ millions.

We can decompose the projected percentage change in imports into the three channels through which changes in tariffs lead to changes in import demand, the substitution channel, the import competitiveness channel, and the export competitiveness channel. Table 6 shows that for the regions whose import tariffs change due to graduation the substitution effect is the dominant channel. As a matter of fact the total reduction in imports of countries phasing out preferences is smaller than the reduction through the substitution effect. The reason is that both the import and export competitiveness term dampen the change in imports. Because import prices of countries phasing out preferences go up, the aggregate import price also rises which counters the loss of exports because of the substitution effect. The production price in graduating countries falls because of the reduced demand from graduating countries which also dampens the loss through the substitution effect. For the EU and Canada the import and export competitiveness channel are roughly equal in magnitude, whereas for the other graduating regions the import competitiveness channel is much smaller than the export competitiveness channel. For non-graduating countries the substitution effect is zero and the entire increase is driven by the import and export competitiveness channels. However, Table 6 shows that the import competitiveness channel is an order of magnitude smaller than the export competitiveness channel. Hence, most of the increase in exports of graduating countries to third countries not changing their tariffs is driven by the reduction in export prices of the LDCs because of reduced demand from the countries phasing out their preferences.

5.2. Lowering the bar: two extended graduation experiments

In this subsection we explore the projected effects under two alternative scenarios in which the set of graduating countries is broadened: in the first scenario, we include graduation of the LDCs above one of the three thresholds defined by CDP in 2018; in the

Table 6. Export and tariff change in the clothing sectors for graduating LDCs, by importing country.

Importer	Initial imp. US$,000	Imp. change US$,000	Eff. tariff change	Percentage change	Subst. effect	Import compet.	Export compet.
European Union	20,215,196	−5,269,795	9.14	−0.26	−0.50	0.11	0.13
Canada	1,155,583	−486,350	14.85	−0.42	−0.64	0.11	0.11
Japan	1,762,128	−263,124	5.00	−0.15	−0.27	0.02	0.10
Korea, Rep.	599,593	−125,752	6.43	−0.21	−0.32	0.02	0.09
China	557,981	−17,711	2.48	−0.03	−0.16	0.01	0.11
New Zealand	77,144	−10,240	5.01	−0.13	−0.32	0.04	0.15
Switzerland	522,529	−436	2.23	0.00	−0.13	0.02	0.12
Chile	86,042	7168	0.64	0.08	−0.05	0.01	0.13
India	244,102	15,750	0.00	0.06	−0.01	−0.02	0.10
United States	5,428,211	408,365	0.00	0.08	0.00	0.00	0.08
Middle East	932,603	103,601	0.00	0.11	0.00	0.00	0.11
Russian Federation	758,918	72,561	0.00	0.10	0.00	−0.02	0.11
Rest of America	636,139	68,815	0.00	0.11	0.00	0.00	0.11
Rest of Asia	607,667	68,060	0.00	0.11	0.00	0.00	0.11
Australia	616,314	67,824	0.00	0.11	0.00	−0.02	0.13
Turkey	460,765	29,042	0.00	0.06	0.00	−0.01	0.07
Norway	256,935	26,313	0.00	0.10	0.00	−0.01	0.11
Africa	182,872	20,038	0.00	0.11	0.00	0.00	0.11
CIS	99,666	11,057	0.00	0.11	0.00	0.00	0.11
Thailand	51,043	5410	0.00	0.11	0.00	0.00	0.11
Rest of Europe	48,288	5383	0.00	0.11	0.00	0.00	0.11
Kazakhstan	40,249	3880	0.00	0.10	0.00	0.00	0.10
Iceland	10,894	1157	0.00	0.11	0.00	0.00	0.11
Armenia	10,454	1066	0.00	0.10	0.00	0.00	0.10
South Asia	11,072	858	0.00	0.08	0.00	0.00	0.08
Pacific	1428	224	0.00	0.16	0.00	−0.01	0.17

Notes: The second column reports the initial import value of each importing region, columns 3 to 5 respectively report the simple import change, the effective tariff change and the percentage import following graduation assuming the partial utilization of LDC preferences and columns 6 to 8 report the respective contribution of the substitution, import competitiveness and export competitiveness effects to the percentage import change (the sum of column 6–8 is equal to the values reported in column 5).

second scenario we assume that all the LDCs would graduate. The results of these experiments are presented in Table 7, which reports initial exports, projected export changes (both in US$ and as a percentage of initial exports) and the effective tariff change for both groups of countries.

Three results stand out. First, both experiments show that there are several countries which would lose a significant amount of trade without LDC-specific preferences. Other than the graduating countries analyzed before, Cambodia would lose around 10% of its exports in both scenarios for a total amount of 1.7 US$ billions and Comoros would lose around 16%. Among the countries that did not reach any of the thresholds estabilshed by the CDP, the largest losses would be expected in Malawi (−9%) and Mozambique (−5%). The only LDC that would increase its exports, even if of a modest amount, is Haiti, that would become relatively more competitive in the clothing sector as its competitors would struggle following graduation (especially Bangladesh).

Second, we can see that the export decreases are in general slightly less pronounced if more countries graduate. The reason is that the trade shifting on the importer side tends to be less pronounced if the set of non graduating countries is smaller. This result emphatizes that the redistributive effects of graduation are not independent of how many countries are subject to a tariff shock, but the size of this channel appears to be quite small.

Third, the graduation of a selected group of LDCs induces reverse preference erosion on the non graduating exporters. Table 8 shows the export change of the other LDCs (i.e. the LDCs that have not met yet the graduation criteria) both in the baseline scenario discussed in Section 5.1 (graduation of the 12 LDCs that are expected to graduate according to the 2018 CDP triennal review) and in the extended exercise where all the 26 countries that met at least one out of three graduation criteria in 2018 graduate. The aggregate result is that the reverse preference erosion effect, i.e. the shift of imports from graduating to non graduating LDCs due to the change in relative prices, is bigger if more countries graduate: it is equal to US$ 22,221 in the first exercise and to US$ 88,078 if the sample of graduating countries is extended, with peaks in Madascar, Ethiopia and Mozambique. As we already discussed when we presented Table 4, some countries are projected to experience slightly negative export changes because reverse preference erosion is accompanied by trade shifting on the export side. In general, the magnitude of the gains from reverse preference erosion seems to be relatively small (less than 2% of the initial exports for all the exporters in both scenarios).

5.3. From partial to full preference utilization

In this section we report the results of going from partial to full preference utilization. More specifically, we simulate the effects of all LDCs simultaneously starting to fully use preferences. A scenario in which preferences are fully used is unlikely, but the results can be interpreted as an upper-bound estimation of the potential benefits that LDCs could enjoy if they would fully utilize their preferences.

Table 9 displays the initial exports, the projected export change (both in US dollars and as a percentage of initial exports) and the effective tariff change for all LDCs as well as the other exporting regions.

The aggregate figure for least developed countries is significant: our model projects an effective tariff change of −0.77, implying an increase in exports of more than 6,920 US$ millions, which is around 4% of the initial figure. The countries that would benefit

Table 7. Impact of graduation on a selected group of countries and all LDCs.

		Selected group			All LDCs		
Exporter	Initial exp. US$,000	Exp. change US$,000	Percentege change	Eff. tariff change	Exp. change US$,000	Percentege change	Eff. tariff change
Afghanistan	1,196,480				−6536	−0.01	0.17
Angola	36,694,340	−25,979	0.00	0.02	−25,934	0.00	0.02
Bangladesh	37,633,733	−5,182,779	−0.14	5.73	−5,177,919	−0.14	5.73
Benin	1,308,767				−6245	0.00	0.21
Bhutan	295,867	−4243	−0.01	0.26	−4243	−0.01	0.26
Burkina Faso	2,576,107				−2570	0.00	0.03
Burundi	203,348				−2276	−0.01	0.32
Cambodia	17,999,506	−1,735,474	−0.10	4.09	−1,734,671	−0.10	4.09
Central African Republic	165,877				−37	0.00	0.01
Chad	1,765,591				−2774	0.00	0.03
Comoros	111,233	−17,909	−0.16	9.46	−17,721	−0.16	9.46
Congo, Dem. Rep.	9,077,785	−77,353	−0.01	0.19	−76,739	−0.01	0.19
Djibouti	139,342	−1136	−0.01	0.33	−1012	−0.01	0.33
East Timor	123,038	−36	0.00	0.01	−4	0.00	0.01
Eritrea	503,331				−3305	−0.01	0.14
Ethiopia	2,746,401				−89,176	−0.03	1.62
Guinea	5,609,436	−171	0.00	0.00	−193	0.00	0.00
Guinea-Bissau	354,711				−48	0.00	0.00
Haiti	1,203,148	1603	0.00	0.10	1637	0.00	0.10
Kiribati	153,730	−300	0.00	0.06	−295	0.00	0.06
Lao PDR	4,581,917	−64,777	−0.01	0.65	−64,408	−0.01	0.65
Lesotho	1,193,174	−1879	0.00	0.11	−1880	0.00	0.11
Liberia	1,860,261				−15	0.00	0.00
Madagascar	3,569,929				−98,612	−0.03	1.45
Malawi	993,336				−87,996	−0.09	5.89
Mali	2,459,324				−6393	0.00	0.13
Mauritania	2,780,415	−114,613	−0.04	1.18	−112,400	−0.04	1.18
Mozambique	6,337,377				−289,524	−0.05	1.18

Myanmar	13,028,355	−482,006	−0.04	1.75	−480,503	−0.04	1.75
Nepal	812,796	−19,830	−0.02	0.90	−19,807	−0.02	0.90
Niger	737,645				−10,934	−0.01	0.89
Rwanda	706,440				−2911	0.00	0.13
Sao Tome and Principe	16,043	−14	0.00	0.03	−14	0.00	0.03
Senegal	3,558,764				−104,214	−0.03	0.99
Sierra Leone	864,643				−1352	0.00	0.09
Solomon Islands	826,170	−34,399	−0.04	1.35	−34,391	−0.04	1.35
Somalia	579,151				−973	0.00	0.05
South Sudan	1,579,478	−54	0.00	0.00	−36	0.00	0.00
Sudan	4,476,447	−101,067	−0.02	1.03	−85,920	−0.02	1.03
Tanzania	5,374,605	−118,417	−0.02	1.07	−108,848	−0.02	1.07
The Gambia	202,951				−1443	−0.01	0.23
Togo	3,411,862	−20,377	−0.01	0.20	−13,733	0.00	0.20
Tuvalu	58,623	−5	0.00	0.00	−4	0.00	0.00
Uganda	2,438,733	−25,157	−0.01	0.43	−23,708	−0.01	0.43
Vanuatu	293,961	−862	0.00	0.14	−851	0.00	0.14
Yemen	1,885,550				−7485	0.00	0.10
Zambia	7,631,890	−144,890	−0.02	0.61	−143,010	−0.02	0.61

Notes: The second column reports the initial export value of each LDC, columns 3 to 5 respectively report the simple export change, the percentage export change and the effective tariff change following graduation assuming that the countries that satisfied at least one CDP criterion in 2018 graduate from the LDC status, whereas columns 6 to 8 report the simple export change, the percentage export change and the effective tariff change if all LDCs graduate. All scenarios assume partial utilization of LDC preferences.

Table 8. Impact of graduation on the other LDCs under the baseline (12 countries graduate) and the extended scenario (26 countries graduate).

		12 LDCs		26 LDCs	
Exporter	Initial exp. US$,000	Exp. change US$,000	Percentege change	Exp. change US$,000	Percentege change
Afghanistan	1,196,480	31	0.00	193	0.00
Benin	1,308,767	4	0.00	256	0.00
Burkina Faso	2,576,107	1	0.00	−169	0.00
Burundi	203,348	−1	0.00	34	0.00
Central African Republic	165,877	0	0.00	−2	0.00
Chad	1,765,591	0	0.00	44	0.00
Eritrea	503,331	159	0.00	220	0.00
Ethiopia	2,746,401	3697	0.00	24,624	0.01
Guinea-Bissau	354,711	−1	0.00	−13	0.00
Liberia	1,860,261	0	0.00	0	0.00
Madagascar	3,569,929	14,725	0.00	26,491	0.01
Malawi	993,336	1,320	0.00	6917	0.01
Mali	2,459,324	32	0.00	3472	0.00
Mozambique	6,337,377	1289	0.00	12,293	0.00
Niger	737,645	86	0.00	9532	0.01
Rwanda	706,440	95	0.00	147	0.00
Senegal	3,558,764	656	0.00	3506	0.00
Sierra Leone	864,643	32	0.00	63	0.00
Somalia	579,151	−9	0.00	70	0.00
The Gambia	202,951	11	0.00	116	0.00
Yemen	1,885,550	95	0.00	284	0.00
Total	34,575,985	22,221	0.00	88,078	0.00

Notes: The second column reports the initial export value of each non graduating LDC, columns 3 and 4 respectively report the simple and percentage export change in the scenario where 12 LDCs graduate whereas columns 5 and 6 report the simple and percentage export change in the extended graduation experiment where 26 LDCs graduate. All scenarios assume partial utilization of LDC preferences and the countries reported in the table are the ones that do not graduate in both scenarios.

the most from full preference utilization as a proportion of initial exports are Bhutan (+27%), Tuvalu (+26%), Nepal (+20%) and Afghanistan (+11%). Looking at the absolute values, the LDCs that would see the biggest export increases are Cambodia (976 US$ millions), Bangladesh (935 US$ millions), Angola (825 US$ millions), Myanmar (740 US$ millions) and Congo (547 US$ millions). The only country projected to face a moderate decrease in exports is South Sudan (−175 thousands US$). The reason is increased competition in its exporting markets. The average price level is projected to fall in its export markets, because other LDCs would start to fully utilize their preferences and this effect is projected to dominate the direct benefits of reduced tariffs for South Sudan. In the other LDCs instead the direct positive effects dominate.

Table 10 shows the initial exports, export change (both in US dollars and as a percentage of initial exports) and effective tariff change by MTN sector in case of full preference utilization. The sectors characterized by the highest export increases as a proportion of the initial exports are Chemicals (+12%), Sugars and confectionery (+11%), Fruits, vegetables and plants (+8%) and Textiles (+8%). In absolute values, the sectors that would benefit the most from fully using LDC preferences are Minerals and metals (3273 US$ millions) and Clothing (1134 US$ millions). As was also the case for the graduation experiment in Table 5, the export change is projected to be zero for Cotton, as there is no change in the tariff rate (i.e. the best preferential rate if equal to the MFN rate).

Table 9. Initial exports, change in exports and effective tariff change of all LDCs (assuming they start to fully use preferences).

Product	Initial exp. US$,000	Exp. change US$,000	Percentege change	Eff. tariff change
Afghanistan	1,196,480	129,413	0.11	−3.42
Angola	36,694,340	825,828	0.02	−0.24
Bangladesh	37,633,733	935,405	0.02	−0.69
Benin	1,308,767	22,510	0.02	−0.36
Bhutan	295,867	79,836	0.27	−5.46
Burkina Faso	2,576,107	219,322	0.09	−1.81
Burundi	203,348	3,392	0.02	−0.26
Cambodia	17,999,506	976,912	0.05	−1.42
Central African Republic	165,877	5124	0.03	−0.41
Chad	1,765,591	6364	0.00	−0.07
Comoros	111,233	1882	0.02	−0.43
Congo, Dem. Rep.	9,077,785	547,172	0.06	−1.22
Djibouti	139,342	4337	0.03	−0.94
East Timor	123,038	2454	0.02	−0.48
Eritrea	503,331	9199	0.02	−0.27
Ethiopia	2,746,401	72,141	0.03	−0.70
Guinea	5,609,436	176,134	0.03	−0.60
Guinea-Bissau	354,711	968	0.00	−0.06
Haiti	1,203,148	32,570	0.03	−0.62
Kiribati	153,730	1157	0.01	−0.19
Lao PDR	4,581,917	144,698	0.03	−0.79
Lesotho	1,193,174	46,244	0.04	−0.44
Liberia	1,860,261	26,350	0.01	−0.32
Madagascar	3,569,929	102,786	0.03	−0.65
Malawi	993,336	17,965	0.02	−0.66
Mali	2,459,324	44,359	0.02	−0.36
Mauritania	2,780,415	23,659	0.01	−0.20
Mozambique	6,337,377	184,212	0.03	−0.59
Myanmar	13,028,355	740,396	0.06	−1.50
Nepal	812,796	164,689	0.20	−4.73
Niger	737,645	15,025	0.02	−0.26
Rwanda	706,440	3447	0.00	−0.08
Sao Tome and Principe	16,043	208	0.01	−0.27
Senegal	3,558,764	249,723	0.07	−1.14
Sierra Leone	864,643	10,033	0.01	−0.22
Solomon Islands	826,170	33,269	0.04	−0.54
Somalia	579,151	10,505	0.02	−0.36
South Sudan	1,579,478	−175	0.00	0.00
Sudan	4,476,447	54,062	0.01	−0.33
Tanzania	5,374,605	335,509	0.06	−1.38
The Gambia	202,951	2643	0.01	−0.25
Togo	3,411,862	51,522	0.02	−0.24
Tuvalu	58,623	15,218	0.26	−5.76
Uganda	2,438,733	20,940	0.01	−0.19
Vanuatu	293,961	13,166	0.04	−1.25
Yemen	1,885,550	14,505	0.01	−0.13
Zambia	7,631,890	543,525	0.07	−0.99
Total	192,121,612	6,920,602	0.04	−0.77

Notes: The second column reports the initial export value of each LDC, columns 3 to 5 respectively report the simple export change, the percentage export change and the effective tariff change in the scenario where all LDCs simultaneously shift from partial to full preference utilization.

Table 10. Export and tariff changes in all LDCs by MTN sector (assuming they start to fully use preferences).

Product	Initial exp. US$,000	Exp. change US$,000	Percentege change	Eff. tariff change
Animal products	1,253,720	12,890	0.01	−0.28
Beverages and tobacco	2,007,653	41,479	0.02	−0.68
Cereals and preparations	1,617,402	27,779	0.02	−0.54
Chemicals	2,889,302	338,339	0.12	−1.86
Clothing	48,099,213	1,134,139	0.02	−0.73
Coffee, tea	2,404,571	15,242	0.01	−0.13
Cotton	1,010,834	0	0.00	0.00
Dairy products	133,974	104	0.00	−0.45
Electrical machinery	1,762,283	95,748	0.05	−1.12
Fish and fish products	4,582,762	164,858	0.04	−0.77
Fruits, vegetables, plants	6,793,932	518,257	0.08	−2.67
Leather, footwear, etc	4,867,716	277,115	0.06	−1.54
Manufactures n.e.s.	2,766,113	88,395	0.03	−0.85
Minerals and metals	55,687,221	3,273,259	0.06	−0.92
Non-electrical machinery	1,037,710	50,395	0.05	−1.04
Oilseeds, fats and oils	2,634,840	61,099	0.02	−0.74
Other agricultural products	2,386,578	65,625	0.03	−0.83
Petroleum	40,749,626	26,074	0.00	−0.01
Sugars and confectionery	434,200	47,520	0.11	−3.35
Textiles	4,004,587	316,145	0.08	−1.94
Transport equipment	2,183,697	133,432	0.06	−1.26
Wood, paper, etc	3,349,438	233,628	0.07	−1.08
Total	192,121,612	6,920,602	0.04	−0.77

Notes: The second column reports the initial export value of each MTN sector for all LDCs, columns 3 to 5 respectively report the simple export change, the percentage export change and the effective tariff change in the scenario where all LDCs simultaneously shift from partial to full preference utilization.

6. Concluding remarks

This paper presented a novel partial equilibrium framework which is well suited to analyze the trade impacts of preferential duty schemes. Using the preference utilization data available through the WTO PTA database, we compute the effectively applied tariffs to LDCs. This allows us to perform a variety of trade policy experiments, including simulating the potential impact of LDC graduation, changing the set of graduating countries, and removing the constraints to preference utilization.

Our results suggest that trade preferences have an important role in fostering the degree of market access of LDC exporters. When it comes to the 12 LDCs that are expected to graduate, the estimated aggregate loss in exports induced by the removal of LDC-specific duty schemes is 6024 US$ millions, corresponding to around 6% of their total exports. This result is mitigated by the fact that the utilization of LDC schemes is not full: if they were fully utilized, the aggregate projected loss would exceed 8 US$ billions. Extending the removal of LDC preferences to the LDCs that are not yet expected to graduate, we show that such schemes have an important role also in lower income countries, with an effect especially strong in Cambodia, Comoros, Malawi and Mozambique. On the other hand, shifting from a partial to a full preference utilization regime would entail substantial benefits for most LDCs, with an aggregate estimated increase in exports of 6920 US$ millions.

We can draw at least two policy-relevant conclusions from our results. First, LDC graduation will have a moderate but non-negligible impact on market access. The impact is moderate for most regions, because the utilization of LDC schemes is low in general.

However, the effect is expected to be substantial for some country-sector pairs (in particular, the clothing sector in Bangladesh). Our projection results suggest that the impact of graduation will be heterogeneous across importers, exporters and industries, and the decision makers of graduating and preference granting countries should design targeted policies in order to mitigate its negative effects. Graduating should anticipate the market access tightening through policies aimed at strengthening the resilience of the manufacturing sector, providing firms incentives to grow and become more competitive in the international markets. They should also be aware that, even if our partial equilibrium model does not explicitly show this, the reduction in exports is likely to induce a temporary increase in the unemployment rate and a broader reallocation of the production factors.

Preference granting countries might consider adopting a transition period in order to mitigate the negative impact of graduation and provide development support in order to help the benefiting countries to adapt to the new policy environment (WTO 2020). On the other hand, the promotion of a higher degree of regional integration through reciprocal trade agreements could be an alternative solution to preserve the benefits of preferential market access.

On a totally different note, we find that the gains from removing the obstacles to preference utilization would be substantial. Low utilization rates depend on importer-specific trade policies (low preference margins and restrictive rules of origin), on the production structure of the exporting countries (insufficient export scale and value added), as well as bilateral factors such as linguistic and cultural proximity (Cariola and Lanz 2022). As a consequence, the reduction of the barriers that prevent LDCs from using preferences can be implemented both on the exporter and importer side. Exporting countries should promote policies that provide firms incentives to grow and make the industrial structure more competitive; such policies include education and R&D investments, infrastructural projects, and institutional reforms. On the other hand, since preference margins are already close to zero (WTO 2020), the most relevant policy that preference granting members should consider is a broad relaxation of the restrictiveness of rules of origin, which would be also in line with the provisions of the Nairobi Ministerial Decision on preferential rules of origin for LDCs.

The study also has limitations and we will mention three. First, we do not take into account changes along the extensive margin within detailed products. Second, our study focuses on projecting changes in trade patterns as a result of graduation and does not evaluate the broader welfare effects of graduation, which would require for example the inclusion of intermediate linkages and general equilibrium effects through changes in income. Third, our analysis is conducted in a comparative static framework not taking into account expected changes in GDP of the different countries.

Notes

1. Australia, Canada, Chile, China, Chinese Taipei, the European Union, India, Japan, South Korea, Switzerland, Thailand, United States.
2. When estimates are not available for specific products, we use 2-digit averages.
3. A related problem is the so-called Henning conundrum as described in J. F. Francois and Hall (1997), which refers to a situation where domestic demand would increase in response to falling tariffs on imported goods because the substitution elasticity between sectors would be bigger than the substitution elasticity between different sources of supply.
4. A more extensive discussion of the three mitigating factors can be found in WTO (2020).

5. On the other hand, the European Commission recently decided to partially withdraw Cambodia's preferential access to the EU market under the Everything But Arms (EBA) framework due to human rights concerns. This policy measure goes beyond the scope of the present work and might have an impact on Cambodia's clothing exports.

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Appendix: Calibration of the model

The model is calibrated in GAMS and the calibration methodology consists in finding the values of the shifters ω_{ijk}, λ_{ik} and κ_{jk}^{imp} such that prices are equal to one in the baseline.

Let us define aggregate supply as the exported value exclusive of tariffs:

$$supply_{ijk} = p_{ik} m_{ijk} \tag{A1}$$

Which will be actually equal to m_{ijk} if all prices are equal to 1. Define the aggregate demand as:

$$demand_{jk} = \sum_i p_{ik} \left(1 + t_{ijk}\right) m_{ijk} = \sum_i \left(1 + t_{ijk}\right) supply_{ijk} \tag{A2}$$

i.e. the tariff inclusive value of the imports of good k, which is by definition equivalent to E_{jk}^{imp}.

We solve for the shifters such that prices are equal to 1 in the baseline scenario. Starting from ω_{ijk}, we have that:

$$p_{ik} \left(1 + t_{ijk}\right) m_{ijk} = \omega_{ijk}^{\sigma_k} \left(p_{ik} \left(1 + t_{ijk}\right)\right)^{1-\sigma_k} \left(P_{jk}^{imp}\right)^{\sigma_k - 1} E_{jk} \tag{A3}$$

With prices equal to 1, this becomes:

$$\frac{\left(1 + t_{ijk}\right) m_{ijk}}{E_{jk}} = \omega_{ijk}^{\sigma_k} \left(1 + t_{ijk}\right)^{1-\sigma_k} \tag{A4}$$

Or, using the notation we introduced before:

$$\frac{supply_{ijk}}{demand_{jk}} = \omega_{ijk}^{\sigma_k} \left(1 + t_{ijk}\right)^{-\sigma_k} \tag{A5}$$

Which means that the demand shifter can be expressed as follows:

$$\omega_{ijk} = \left(\frac{supply_{ijk}}{demand_{jk}}\right)^{\frac{1}{\sigma_k}} \left(1 + t_{ijk}\right) \tag{A6}$$

In other words, the demand shifter is a function of the market share of exporter i augmented with the tariff rate. In order to prove this, we implicitly assumed that the importer's price index is equal to 1 if all the prices are equal to 1. We can now verify it plugging the result of equation (A6) into the definition of

the price index:

$$P_{jk}^{imp} = \left(\sum_i \left(\left(\frac{supply_{ijk}}{demand_{jk}} \right)^{\frac{1}{\sigma_k}} \left(1 + t_{ijk}\right) \right)^{\sigma_k} \left(p_{ik}\left(1 + t_{ijk}\right)\right)^{1-\sigma_k} \right)^{\frac{1}{1-\sigma_k}} \tag{A7}$$

$$= \left(\sum_i \frac{supply_{ijk}\left(1 + t_{ijk}\right)}{demand_{jk}} p_{ik}^{1-\sigma_k} \right)^{\frac{1}{1-\sigma_k}} \tag{A8}$$

$$= \left(\sum_i \frac{supply_{ijk}\left(1 + t_{ijk}\right)}{\sum_i \left(1 + t_{ijk}\right) supply_{ijk}} \right)^{\frac{1}{1-\sigma_k}} \tag{A9}$$

Which is equal to 1 for any supply and tariff rate.

Finally, given that all the prices and the price index are equal to 1, it is immediate from equations (1) and (4) that $\lambda_{ik} = x_{ik}$ and $\kappa_{jk}^{imp} = E_{jk}^{imp}$ in the baseline.

After calibrating the model with the baseline trade and tariff data described in Section 2.2, we run the simulations for each policy scenario by HS line. As described in Section 2.2, the policy scenarios employ the counterfactual tariffs obtained either through a weighted average where the LDC duty rate is substituted with the best alternative rate (graduation experiments) or by substituting the weighted average tariff with the LDC rate (full use of LDC preferences experiment). The projected impact of each policy experiment is computed by comparing the outcome of the policy simulations, i.e. projected trade flows at the HS 6-digit level, with actual 2016–2018 data from Comtrade, and aggregating the projected changes across products and countries.