Does tariff escalation affect export shares: The case of cotton and coffee in global trade

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Abstract

Many studies show that Tariff Escalation (TE) lowers export shares in many of the processing sectors, given their higher level of protection. However, there are instances when the export shares of processed sectors are higher despite the existence of TE. We examine both these contrasting cases of TE in this paper. On the one hand, there is TE in coffee and coffee products in developing countries, which lead in raw coffee exports and lag in roasted coffee exports. On the other hand, there is a similar pattern of TE in developing countries, which are leading exporters of cotton textiles, but not as much of raw cotton. This raises the question whether TE has a systematic impact on a country's export shares. We use a widely used economy-wide model named GTAP (Global Trade Analysis Project) and its accompanying Data Base 2004 version. We supplement the data with UN commodity statistics and other country-specific and industry-specific sources to split cotton, cotton textiles, coffee and coffee products from aggregated sectors in this dataset. We analyze different policy scenarios of bringing the tariffs for processing sectors to the levels of their raw materials for the value-chains of cotton and coffee. Our results focusing on export shares show that TE can lead to higher or lower export shares depending on various other factors such as the actual tariff differences across sectors and countries.

JEL classification: F14-Country and Industry Studies of Trade; O57-Economywide Comparative Studies of Countries; L66-Food, Beverages, Cosmetics and Tobacco; L67- Clothing, Textiles, Shoes and Leather; N5 – Agriculture.

1. Introduction

The Uruguay Round, through Article 20 of the Agreement on Agriculture (AoA), set up a framework of rules to reduce agricultural protection and trade-distorting support at the multilateral level. Negotiations are ongoing to liberalize agriculture and the World Trade Organization (WTO) Member Countries are currently discussing further agricultural liberalisation under the mandate of the Hong Kong Ministerial Council meeting (in December 2005) and the Framework to Establish Modalities in Agriculture attached to the Doha Work Programme, generally known as the Framework Agreement. The Draft Modalities (December 2008) on Agricultural Market Access (WTO 2008) which builds on the July Framework of 2004 (WTO 2004) includes a "tiered" formula for reduction in bound tariffs; a tiered approach for reductions in trade-distorting domestic support and the abolition of export subsidies.

Within market access negotiations, among other issues, tariff escalation (TE) is an important problem that has been explicitly discussed and is of particular relevance to developing countries which depend much on agriculture (Beghin & Akshoy, 2003; UNCTAD, 2000; World Bank, 2003; Elamin & Khaira, 2004; Sharma, 2006; Wainio & Vanzetti, 2008; Laborde & Martin, 2010). TE involves the imposition of higher import duties on processed products than on input commodities and, therefore, recognized as an important form of protection that impedes developing countries efforts to move from primary goods to value-added production and exports.[1]

TE tends to lower export shares of developing countries in processing sectors since final products enjoy a high level of protection (Wailes et. al. 2004). Studies suggest TE shifts the efforts of exporting countries towards primary commodity production by creating a distinct disincentive to diversity exports and employ resources towards higher stages of agricultural processing (Clarke & Bruce, 2006; Antimiani et al. 2009). Given primary commodity markets are characterized by low and deteriorating world prices the magnitude of this problem is disturbing as it increases the burden on the balance of payments (Corden, 1971).

The economic rationale for developing countries emphasising on the need to address TE in ongoing agricultural negotiations is based on the perception that low tariffs on processed products will support the development of a stronger manufacturing base that will allow these countries to gain a larger share of the final value of exports. There are also associated spill-over effects through additional employment generation, investment opportunities, and

[1] The GATT defines TE on the basis of traded products classification into stages of processing - raw materials, semi-manufactured products, and finished products (GATT, 1994).

sustainable growth which are attributed as other underlying reasons for highlighting the need to address high tariffs on final agricultural products. In the present state, TE continues to be a characteristic feature of the agricultural tariff structure, both for developed and developing countries.

This paper employs a CGE framework to examine whether TE has a systematic impact on a country's export shares. We select two classic cases - raw and roasted coffee that is characterized by high TE; and, cotton and textiles in which the export shares of processed sectors are higher despite TE. Using GTAP Version 8 Data Base 2004 version, we simulate three scenarios to analyse the impact of tariff reductions on exports and imports of raw and processed products (i.e. raw and roasted coffee, cotton and textiles), skilled and unskilled labour, GDP and output, as well as welfare implications.

The paper is structured as follows: section 2 reviews the relevant literature on TE; section 3 discusses the data and modelling framework used for this analysis; section 4 reports the results of simulations and presents economy-wide welfare implications of various economic policy measures and technological changes; section 5 concludes with policy implications and suggests the way forward as to how both developed and developing countries can address the continuing problem of TE.

2. *Background and literature on TE*

The recently agreed Framework of Modalities (on agriculture) list detailed provisions on market access through tariff reductions and other trade distortions in agriculture.[2] The general principle for TE of this Framework is that processed products subject to tariffs higher than the raw material or intermediate product counterpart will be moved into the next higher band for cutting tariffs. If products are in the next higher band, the cut imposed would be 6 percentage points higher than the usual cut in the higher band. However, if the gap between processed and unprocessed product is less than 5 percentage points then the TE procedure will not apply and the tariff cutting rule would not bring tariffs on processed product below the tariff levied on the intermediate product (WTO, 2008; Laborde & Martin, 2010).

Historically, discussions on TE have can be traced to the Tokyo Round when a related statement was incorporated in the 1973 GATT Ministerial Declaration and again in the 1982 Ministerial Meeting of the GATT. The Uruguay Round also discussed TE and information

[2] Tariff reduction will be implemented through a tiered formula which includes four tariff bands and framework for proportional tariff cuts in bound agricultural tariffs implemented in equal annual cuts over five years in developed and eleven years in developing countries.

was made available on percentages and absolute changes on the incidence of TE. The 2004 Framework Agreement (paragraph 36) reiterated its importance and stated "TE will be addressed through a formula to be agreed".[3] Later discussions also suggest modalities to calculate TE and its adjustment formula (WT/AG/W/4/Rev.4).[4] In 2006, specific country proposals were submitted which explicitly recognized the importance and incidence of TE at the multilateral level (TN/AG/GEN/19).[5]

TE is the structuring of tariffs such that countries levy lower levels or zero tariffs on primary products with high import duties on semi-processed products and the highest on finished products. In particular, this has been of concern to developing countries that face high tariffs on processed agricultural products as this fosters specialization in primary products exports (but excludes processed products) and at the same time hinders the development and expansion of agricultural processing industries in these countries (Beghin & Aksoy, 2003). The structure of tariffs thus produces a trade bias against processed goods because of higher import duties imposed on these items (Safadi & Yeats, 1993). TE also has the potential to restrict trade-induced industrialization, deter export-led growth and is often associated as an underlying contributory factor for an anti-agricultural bias in developing countries (Sharma, 2006). Besides, escalation of tariffs in the latter stages of processing of agricultural products provide effective protection and assistance to processing than is evident from the nominal rates, both in developed and developing countries (Laird & Yeats, 1987; Verkat, 2001).

Studies also suggest that in developing countries TE is associated with the import-substitution industrialization strategy, which is designed to foster the development of industries or further processing of natural resource based products previously exported in its primary form (Dollar, 1992). They may retard growth and export-diversification in both agricultural and manufacturing sectors and raise the economy's susceptibility to agricultural price volatility (FAO, 2004). Studies confirm the widespread incidence of TE in agricultural markets, in both

[3]The negotiations to reach a further agreement on agriculture by the Hong Kong Ministerial Council, meeting in December 2005, are taking place on the basis of the Framework to Establish Modalities in Agriculture attached to the Doha Work Programme agreed by the WTO General Council on 1 August 2005 (WT/L/579), generally known as the July Framework Agreement (FA) or "July Package".

[4]Commodity-dependent developing country Members, individually or as a group, were asked to identify and present products of interest for addressing tariff escalation to be adopted as part of the modalities.

[5] Colombia, Costa Rica, Guatemala and Panama have specifically proposed that "the modalities for tropical and alternative products subject to tariff escalation should provide for deeper tariff cuts for processed and semi-processed products than for primary tropical and alternative products", specifically 10 percent greater than the maximum reductions foreseen in the formula

developed and developing countries (Safadi & Yeats, 1993; OECD, 1996, 1997; USDA, 2001; Burman et al. 2001; UNCTAD, 2003).

TE has been documented in earlier studies that estimated nominal and effective protection rates for products in different stages of processing (Balassa, 1968; GATT, 1982). Earlier studies (pre-Uruguay Round) focused primarily on the impact of TE on commodities exported by developing countries. For instance, Balassa (1965, 1968) found TE causing structural bias against developing countries exports of processed commodities. Golub & Finger (1979) examine the impact of TE in developed countries and de-escalation in developing countries. Yeats (1984) looks at TE and shows that a trade bias may exist against processed commodities given the import demand elasticity is higher for processed commodities. Liard & Yeats (1987) report on the incidence of TE among developing countries and expressed concern with declining shares in values of processed commodities in total exports by developing countries, as well as discuss modalities to address the problem of deteriorating terms of trade for primary commodities made worse with low international prices of agricultural products. Clark (1985) analyse TE with regard to the GSP scheme and conclude reducing tariffs have an offsetting impact on exports from developing countries.

Studies in post-UR find that escalation persisted even after the full implementation of the AoA, with higher TE reported in bound than applied tariffs (Lindland, 1997; Elamin & Khaira, 2004). For instance, Lindland (1997) finds positive tariff wedges (i.e. escalating tariffs) in Japan, the EU and U.S. Results for the OECD countries show that reduction of tariffs on processed products was lower than on primary products (OECD, 1996). The UNCTAD (2003) analyses the impact of 50 percent tariff reduction on processed agricultural goods; the estimates of earnings show substantial benefits (>12 billion US$) for all developed countries, including Japan, North America and Western Europe. FAO (2004) finds highest incidence of TE on meat, sugar, fruit, coffee, cocoa, and skins and leather. An earlier study by Cernat et al. (2002) also reports TE as a problem for vegetable oils, beef, eggs, cereal products and tobacco products.

Wailes et al. (2004) finds TE in rice importing countries provides protection to the domestic milling industry such that rice trade of the U.S. is distorted in favour of paddy exports; as a result the demand for rice milling and associated value added activities is low. Elamin & Khaira (2004) find pronounced TE in products such as meat, sugar, fruit, coffee, cocoa, hides and skins, which are of interest to developing countries but report low TE in applied tariffs. Bureau et al. (2007) also report widespread TE in the tariff structure (bound) of the EU, U.S.,

Canada and Japan though this is not the case with applied tariffs, particularly when preferential tariffs apply to developing countries exports. Commodities impacted by TE that causes a lack of credibility of preferential tariff regimes are cotton in Japan and the U.S.; chocolate and fruit juices in the EU and the U.S. (as these contain sugar or milk); and coffee, cocoa, groundnuts, vegetables and citrus fruits in Japan.

Beghin & Aksoy (2003) too highlight TE as being a challenge from many preferential trade agreements as this restrains developing countries from promoting value added industries. Similarly, Antimiani et al. (2009) evaluate TE for four African LDCs and six non-African LDCs to show the existence of TE (from 0% to 80%) in all importing countries except the EU, from where products are exported under preferences. More recently, Berkum (2009) reports TE in the EU and finds that agricultural imports of sugar or dairy products continue to enjoy high protection as well as instance of TE in concentrated fruit juice (for which the sugar content is high).

In this study we choose two different agricultural sectors among those discussed in the literature – cotton and coffee. While developed countries are prominent exporters of raw cotton and coffee products, developing countries are prominent exporters of raw coffee and cotton textiles. This gives us contrasting cases of two different sectors both of which have some TE across the world. Particularly, we ask the question of whether TE matters for the countries' competitiveness and export shares. This study is unique in that there has been no such study of sectors that give a contrasting view of the theoretical basis of TE.

3. *Data and Modelling framework employed*

Different aspects of TE have been modelled in the literature using partial equilibrium and econometric models. Khasnobis (2003) employs a simple production and trade model to examine the differential impact of TE on skilled and unskilled wages in an economy. The study concludes that protection between different stages of production is attributed to lobbying by skilled labour and capital owners in developed countries. Wailes et al. (2004) employ a spatial equilibrium model to evaluate the effects of TE on the U.S. and global rice trade and prices. Wainio & Vanzetti (2008) use a detailed partial equilibrium global trade model to estimate trade and welfare effects from reducing TE; this study confirms earlier findings that TE is a problem in the bound tariffs of developed countries.

Economy-wide models offer deeper insights for trade policy analysis as they account for inter-sectoral linkages and cross-economy resource constraints. However, there are very few studies that use such models in a global framework using disaggregate sectors. Lee et al. (2008) use CGE analysis to assess the extent of TE and welfare effects for Taiwan (with I-O tables for 2004), this study shows that Taiwan should favour tariff reduction to improve overall welfare. Rae & Josling (2003) uses an earlier version of the GTAP Data Base (version 4) and reports TE impedes processed foods exports from developing countries to developed countries but also finds TE within developing countries. This study lacks sectoral details, while Lee et. al. focuses on one country alone.

By using the GTAP model and dataset, we are able to capture international data and linkages. However, sectoral details needed for coffee and cotton do not exist in the base dataset, which is GTAP 8 Data Base 2004 version[6], which compiles data from various sources like ITC (2006) and Boumellassa et. al (2009) (tariff data), UNSD (2004) (merchandise trade data), IMF (2004) (balance of payments), OECD (2006) (services trade data) and OECD (2008) (domestic support data).

We employ numerous sources such a UN commodity statistics dataset[7], International Coffee Organization (ICO) [8] datasets, International Cotton Advisory Committee (ICAC) [9] and country-specific sources and studies for China[10], India[11], USA[12] and Australia[13] for the data

[6]This version is yet to be finalized. However, the 2004 version, which we use herein, is fairly stable and final as it is based on GTAP 7 Data Base, which is published in Narayanan and Walmsley (2008).
[7] http://data.un.org/Browse.aspx?d=ICS, accessed on 3rd May 2011
[8] http://www.ico.org/coffee_prices.asp?section=Statistics, accessed on 3rd May 2011
[9] Mainly for cotton statistics for many countries using data from International Cotton Advisory Committee, available online from http://www.icac.org/econ_stats/country_facts/english.html
[10] Using the data from MacDonald et. al. (2004)
[11]Using the data from Bedi and Cororaton (2008) and http://txcindia.com/html/domestic%20%20sub.htm, accessed on 3rd May 2011
[12] Using data from US Census Bureau (2005a, 2005b)
[13] Using data from Weller (2007)

on production for the value chain of cotton and coffee products. In addition, we use a tool[14] developed by Horridge and Laborde (2008) to obtain disaggregated trade and tariff data for these sectors. Using this information, we split the following sectors in the standard GTAP 8 Data Base 2004 version:

1. Other Crops: Coffee and Other Crops (OthOCR)
2. Plant-based Fibers: Cotton and Other Fibers (OthPFB)
3. Other Food Products: Coffee-products (CofProd) and Other Food Products (othOFD)
4. Textiles: Cotton Textiles (CotTex) and Other Textiles (OthTex)

We aggregate all other sectors in the dataset to the following:

1. Other agriculture
2. Wearing apparel
3. Other manufacturing
4. Services.

Therefore, we have 12 sectors in our dataset and we further aggregate the number of regions in the dataset to 39. We choose 36 countries that are leading producers of one or more of the commodities in the coffee and cotton value-chains. They comprise developing and developed countries from all continents across the world. All other countries are aggregated into Rest of the Developing World (ROWDG), Rest of the Developed World (ROWD) and Rest of the LDCs (ROWLDC).

In order to split the GTAP sectors into those related to cotton and coffee, we supplement the GTAP data with various other sectors. We use the data from Horridge and Laborde (2008) to compute trade and bound tariff rates at modified HS4 level. We also use the production:exports ratio for raw coffee and cotton from ICO and ICAC, respectively to compute production for these sectors in most of the countries. For other sectors, we use data from UN commodity dataset, country sources and then re-adjust them using the trade data and the totals from the GTAP data.

[14] Tariff Aggregation and Simulation Tool for Economists (TASTE)

Table 1: Production data for the sectors related to cotton and coffee in 2004: US$ Millions

Country	Cotton	OthPFB	Coffee	OthOCR	CofProd	OthOFD	CotTex	OthTex	Total
Brazil	1261	0	2660	3158	226	33405	2459	12403	55573
Colombia	49	110	1136	1460	25	5871	552	1025	10229
Indonesia	10	36	446	5224	32	21148	5579	10361	42835
Mexico	316	1140	440	4362	38	59347	324	19252	85219
Vietnam	26	0	764	310	16	4302	219	3099	8736
Guatemala	0	4	458	194	42	2787	138	256	3879
India	7539	0	315	21552	8	28869	33349	13074	104706
Ethiopia	64	0	416	122	23	657	151	8	1441
Peru	186	0	311	2803	8	5068	1595	2962	12932
Nicaragua	0	12	148	0	4	347	52	127	690
CostaRica	1	2	295	366	24	1480	99	183	2450
Venezuela	14	94	469	527	4	6315	409	759	8591
China	5277	0	32	2328	91	120346	105162	70108	303345
UK	12	13	9	1744	1163	72801	13229	8819	97790
Japan	2	396	2	13982	690	158411	1287	29456	204226
France	50	128	16	21056	522	73787	14498	9665	119723
Hungary	2	1	1	896	91	3220	749	993	5953
Singapore	14	1	5	248	89	2624	222	987	4190
Thailand	25	106	27	2402	42	10442	7620	6234	26899
Italy	17	10	13	17564	463	65911	40427	26951	151356
Poland	0	2	1	1280	33	10169	960	1622	14068
Portugal	2	33	1	2955	26	5577	3355	4447	16395
Cyprus	0	0	0	116	17	51	78	103	364
Egypt	407	629	0	117	7	6146	599	5546	13451
Denmark	0	1	1	1152	41	7100	707	1526	10527
Romania	0	53	0	5992	2	752	806	1358	8963
Ukraine	3	3	0	30	1	2711	249	329	3327
Russia	17	12	0	47	4	17917	996	2776	21769
USA	5614	0	27	25389	3799	287429	39820	88389	450467
Turkey	5777	1611	0	3030	5	23825	1470	21099	56817
Korea	6	36	0	2409	3	20670	10229	13559	46912
Pakistan	1496	966	0	2800	0	1056	8022	11478	25817
Germany	36	15	135	12204	1279	84869	11244	14142	123924
Spain	93	131	15	8287	389	36734	9114	6076	60838
Australia	828	0	1	3244	8	18611	2551	3382	28625
Greece	588	762	2	1686	28	9186	2569	1713	16534
Rest-Developed	157	820	98	19846	1205	15969	18766	24876	81738
Rest-Developing	5752	2528	1951	14264	76	130584	27805	51639	234599
Rest-LDCs	3172	621	752	11244	18	96152	7247	7247	126452
Total	38814	10276	10947	216390	10542	1452646	374707	478029	2592350

Source: Data compiled and adjusted from various sources like UN Commodity statistics, ICAC, ICO, TASTE, GTAP 8 Data Base 2004 version.

Table 1 shows the production data for these split sectors in our dataset. India, USA, China, Turkey, Pakistan and Brazil are major producers of cotton, while China, India, some large EU countries, Pakistan and USA lead in cotton textiles production. Raw Coffee produce is led by Brazil, Colombia, Viet Nam, Venezuela, Guatemala, Mexico and Ethiopia, while processed coffee is produce more by developed countries like UK, USA, Germany, France, Japan, Italy and Spain.

Table 2 summarizes the export shares and trade-weighted average bound tariffs[15] for the countries and regions considered in this study. In most of the countries listed here, bound tariffs are much higher for the processing sectors (Cotton Textiles and Coffee products) than for the raw material sectors (Raw Cotton and Coffee). The only exception in the coffee value chain is Mexico, for which the source-wise bound tariffs range from 0 to 24 for coffee production and 0 to 26 for coffee, with many exporters to Mexico facing zero-tariffs for the latter. Thus, TE cannot be ruled out for Mexican coffee sectors as well.

All countries do exhibit tariff escalation at varying degrees, mostly low for coffee and coffee production and relatively high for cotton and cotton textiles. In general, developed countries have lower tariffs and TE than developing countries. For coffee and coffee products, countries like Brazil, Colombia, Guatemala, Peru, Nicaragua and Costa Rica have higher export shares in raw coffee market perhaps due to slightly higher tariffs in coffee processing sector, as the vast literature would suggest. Similarly, for cotton and cotton textiles, countries like Brazil, Australia, USA and Greece have higher shares in raw cotton market than in cotton textiles market. However, despite the existence of conspicuous TE in the cotton and cotton textiles sectors, countries like China, India, Italy and Russia have a far better export performance in their cotton textile sectors than in cotton. Similar contrast can be noted of superior coffee products export performance by many developed countries like UK, Japan, France, Hungary, Denmark, Romania and USA.

[15]This is merely for illustration and we do not account for endogeneity resulting from such an averaging. For example, a zero trade might be caused due to prohibitive tariffs, which will get zero-weight in calculating the average here. Thus, what we see here is, at best, an underestimate of actual protection levels. In the analysis, however, source-specific tariff differences are taken into account.

Table 2: Export Shares (%) and Average Bound tariff rates (%) for Cotton and Coffee Sectors

	Raw Cotton		Cotton Textile Prods		Raw Coffee		Coffee Products	
	Exp Share	Tariff	Exp Share	Tariff	Exp Share	Tariff	Exp Share	Tariff
Brazil	3.56	6.37	0.77	13.11	20.68	0.42	3.62	4.3
Colombia	0.02	10	0.14	14.35	12.26	0.83	0.6	6.51
Indonesia	0.06	0.02	2.3	6.43	4.95	0.96	1.4	4.1
Mexico	0.55	0	0.91	2.63	2.81	10.18	1.62	3.27
Vietnam	0.01	0	0.39	30.26	8.37	1.49	0.77	13.76
Guatemala	0	0	0.06	8.07	4.44	0.29	0.95	3.24
India	2.19	11.07	5.04	16.47	2.77	35.68	0.36	39.76
Ethiopia	0.08	0.07	0.02	29.16	3.81	0.13	0.78	13.05
Peru	0.05	11.11	0.21	12.73	5.46	1.42	0.4	6.63
Nicaragua	0	0	0	7.37	2.1	2.16	0.08	5.55
CostaRica	0.01	0	0.02	8.68	2.46	0.73	0.61	4.49
Venezuela	0	7.18	0.01	11.79	0.16	0.27	0.19	1.58
China	0.18	4.29	14.9	7.24	1.12	4.42	1.12	11.8
UK	0.09	0	1.54	1.93	0.09	0	2.35	0.4
Japan	0.02	0	3.27	3.68	0.06	0	0.31	3.94
France	0.35	0	3.55	0.84	0.21	0	3.72	0.3
Hungary	0.02	0	0.37	0.74	0.02	0	0.36	0.21
Singapore	0.13	0	0.41	0	0.16	0	0.59	0
Thailand	0.03	0.04	1.76	5.63	0.25	2.52	0.87	14.91
Italy	0.13	0	8.98	1.78	0.22	0	16.71	1.01
Poland	0	0	0.3	0.58	0.05	0	1.3	0.5
Portugal	0.01	0	1.02	1.07	0.01	0	0.68	0.03
Cyprus	0	0	0.01	2.8	0	0	0.01	0.99
Egypt	1.7	0	0.55	11.76	0.05	5	0.04	61.28
Denmark	0	0	0.41	0.91	0.11	0	2.09	0.38
Romania	0	0	0.37	0.27	0	0.43	0.06	0.63
Ukraine	0.03	0.12	0.06	3.98	0.02	1.49	0.08	6.91
Russia	0.16	0.02	0.5	9.73	0.01	1.3	0.41	9.16
USA	40.68	3.72	6	6.42	1.31	0	9.21	0
Turkey	2.05	0	3.29	2.93	0.14	12.38	0.2	18.04
Korea	0.06	0.08	3.23	6.51	0.05	5.31	0.19	29.91
Pakistan	0.7	5.14	4.73	16.95	0.02	0.41	0.02	9.36
Germany	0.28	0	5.74	1.17	1.26	0	17.34	0.59
Spain	0.85	0	2.52	1.43	0.24	0	2.2	0.36
Australia	6.44	0	0.23	8.77	0.18	0	0.41	0.04
Greece	3.59	0	0.8	1.76	0.08	0	0.24	0.19
Rest-Developed	0.89	0	9.84	1.73	2.79	0.23	22.42	1.08
Rest-Developing	18.74	1.18	14.69	6.68	8.06	10.76	4.72	4.01
Rest-LDCs	16.34	1.01	1.08	18.16	13.22	4.46	0.95	13.94

Source: Authors' calculations from GTAP 8 Data Base 2004 Version

GTAP (Hertel, 1997) is a multi-regional and multi-sectoral CGE model wherein demand and supply are balanced in all markets, implying that the price received by the producer the same as the producer's marginal cost. By imposing taxes and subsidies on commodities and primary factors, regional government, which is not an explicitly defined agent, can drive wedges between prices paid by purchasers and prices received by producers. International trade is linked through Armington substitution among goods differentiated by country of origin. Product differentiation between imports by region of origin allows for two-way trade across regions in each tradable product. There are two types of inputs-intermediate inputs and five primary factors used for production, mixed so as to minimize total cost at a given output level in each region and sector. We assume perfect competition and full employment in this model.

In this study, we run a policy experiment that equalizes the bound tariffs for the raw material and processing sectors in cotton and coffee sectors. Given that TE has been prevalent across these sectors, we bring the tariff levels of coffee production and cotton textiles to coffee and cotton, respectively. This causes overall decline in tariffs, with a few exceptions discussed above, which have lower tariffs at the advanced processing stage. Such a policy shock would drive the prices down for coffee products and cotton textiles, making them more competitive. We examine the results for such a policy sectors across different combinations of sectors and countries given below in the next section:

1. Total: All the tariffs for coffee production and cotton textiles sectors are brought to the bound tariff levels of coffee and cotton sectors, respectively, in all countries.

2. TE-Coffee: All the tariffs for coffee production sector are brought to the bound tariff levels of coffee sector in all countries.

3. Cf-S: All the tariffs for coffee production sector are brought to the bound tariff levels of coffee sector in all developing countries.

4. Cf-N: All the tariffs for coffee production sector are brought to the bound tariff levels of coffee sector in all developed countries.

5. Cf-S-S: All the tariffs for coffee production sector are brought to the bound tariff levels of coffee sector for the trade between all developing countries.

6. TE-Cotton: All the tariffs for cotton textiles sector are brought to the bound tariff levels of cotton sector in all countries.

7. Ct-S: All the tariffs for cotton textiles sector are brought to the bound tariff levels of cotton sector in all developing countries.

8. Ct-N: All the tariffs for cotton textiles sector are brought to the bound tariff levels of cotton sector in all developed countries.

9. Ct-S-S: All the tariffs for cotton textiles sector are brought to the bound tariff levels of cotton sector for the trade between all developing countries.

While the GTAP model includes hundreds of equations capturing various aspects of the economy discussed in this section, we highlight equation (1) below, which is relevant for international trade alone. We define sets SECT of commodities, REG of regions. Percentage changes in exports of commodity k from region r to region s $\exp_{k,r,s}$ depends positively on aggregate imports changes for that commodity k in region s $imp_{k,s}$, which is analogous to market expansion or domestic penetration effect and negatively on the wedge between the domestic market prices in region s of exports from region r of commodity k, $pms_{k,r,s}$ and the aggregate import prices in region s for the same commodity $pim_{k,s}$. The latter may be thought of as substitution effect between different sources. Armington elasticity of substitution across sources σ_{Mk} determines the degree of pass-through of the price differences to the export changes.

$$\exp_{k,r,s} = imp_{k,s} - \sigma_{Mk}[pms_{k,r,s} - pimk_{k,s}], \forall k \in SECT; r,s \in REG \quad (1)$$

The standard GTAP model was modified for this study to introduce a new variable that captures the percentage changes in the export shares $exshr_{k,s}$, as differences between the sector-wise export growth rates $exag_{k,s}$ in each country s and CIF-weighted ($\theta_{k,r}$) average of corresponding sector-wise export growth rate in countries across the world. While a huge model like GTAP will give a lot of interesting results pertinent to various parts of the world economy, we are most interested in explaining what happens to these changes in export shares.

$$exshr_{k,s} = exag_{k,s} - \sum_{r \in REG} \theta_{k,r}[exag_{k,r}], \forall k \in SECT; r,s \in REG \quad (2)$$

Economy-wide studies are incomplete without a discussion about the welfare implications and their sources. In the GTAP model, welfare is measured in terms of equivalent variation, which is measured in terms of base values of different variables such as exports, imports and output, percentage changes in their corresponding prices and quantities. This is decomposed into various parts (Huff and Hertel, 2001), but the only components that are relevant for a tariff policy change are as follows:

1. Allocative efficiency effects

2. Terms of Trade effects

Allocative efficiency effects measure the extent to which there are efficiency gains in terms of better allocation of resources. For example, if there is a reduction in distortive taxes/tariffs/subsidies, there is an allocative efficiency gain and if there is an increase in exports in a sector that has export taxes, there is an allocative efficiency loss, for a given change in volume. Equation (3) highlights the part of this GTAP model equation that is relevant for us. Allocative efficiency has two parts:

1. Export tax effect: Given the level of export taxes for trade flows of commodity i from regions r to s, $\tau^{EX}_{i,r,s}$, change in exports $\exp_{i,r,s}$ at base FOB price levels $P^{FOB}_{i,r,s}$ determine the export tax effects. Our dataset contains the export-tax equivalents of the MFA (Multi-Fiber Arrangement) quotas (Francois and Worz, 2008), since the base year is 2004, the year before these quotas were phased out. Thus an expansion of textile exports may cause an allocative efficiency loss, since there are positive export taxes.

2. Import tax effects: These are similar to the export tax effects, except that they capture the change in source-destination-wise changes in import volume at constant CIF prices $P^{CIF}_{k,r,s} imps_{k,r,s}$, and the import tariffs associated with the corresponding trade flows. Similarly the terms-of-trade effects capture the changes in aggregate net exports, considering the changes in the prices as well as shown in (3).

$$EV_s = (\psi_s)\left[\overbrace{\underbrace{\sum_{i\in SECT}\sum_{r\in REG}\left(\tau^{EX}_{i,r,s}P^{FOB}_{i,r,s}\exp_{i,r,s}\right)+\sum_{k\in SECT}^{K}\sum_{r\in REG}^{R}\left(\tau^{IM}_{k,r,s}P^{CIF}_{k,r,s}imps_{k,r,s}\right)}_{+\sum_{k\in SECT}\sum_{r\in REG}^{R}\left(EXP_{k,s,r}dP^{FOB}_{k,s,r}\right)-\sum_{k\in SECT}\sum_{r\in REG}^{R}\left(IMPS_{k,r,s}dP^{CIF}_{k,r,s}\right)}}^{ALLOCATIVE-EFFICIENCY-EFFECT}\right] \quad \textbf{(3)}$$

$$TERMS-of-TRADE-EFFECT$$

4. Results

At a global level, average export shares expand sharply (over 20%) for cotton textiles and slightly (about 2%) for coffee production, due to complete removal of tariff escalation by all the countries in coffee and cotton sectors. This result, combined with the observation from Table 2 that TE appears to be relatively less prevalent[16] in the coffee than in the cotton sectors, suggests that on a global average level, removing TE does help in improving the export shares for the processing sectors. However, this is not a strong evidence for this phenomenon, because this is quite an aggregate level and it is essential to look into the country-level results to see how their export-shares depend on the removal of tariff-escalation.

Tables 3 and 4 show the differences between the global average growth rates and country-level growth rates in exports, inferred as growth in export shares, for coffee and cotton sectors, respectively. As Table 3 shows, countries like Brazil, Colombia, Nicaragua, Venezuela and many developed countries grow their export shares owing to the removal of TE. Most of this is clearly due to the complete removal of TE by all of the countries. Almost all of the changes may be traced to the removal of TE in coffee (table 3) and cotton (table 4), indicating that these sectors do not affect each other a lot.

For coffee, table 3 shows that Ethiopia, Mexico, Peru, Costa Rica, China, Thailand and Pakistan lose more due to the unilateral TE removal by the developed countries, than due to their own removal of TE. Other developing countries seem to benefit more or lose less from the removal of TE by developed countries rather than that by the developing countries including themselves. TE removal among the developing countries causes growth in export shares for the developed countries and mixed results for the developing countries.

Table 4 shows that cotton textiles sectors in Indonesia, Viet Nam, India, China, Japan, Singapore, Thailand, Russia, Korea, Pakistan, Spain, Turkey, USA and Australia expand in terms of relative export shares, owing to the removal of TE. Even the countries that lose conspicuously as seen in table 4, gain more or lose less in a scenario where merely the developed countries remove their TE.

[16] While the objective of this study is not to identify the degree of TE for different countries and sectors, it can be said with reasonable confidence from Table 1 that the escalation is perhaps slightly stronger in cotton than in coffee.

Table 3: Percentage changes in export shares for coffee production under different scenarios

Country	Total	TE-Coffee	Cf-S	Cf-N	Cf-S-S
Brazil	2.55	2.42	-7.43	9.85	-6.38
Colombia	1.78	1.33	0.31	1.03	0.83
Indonesia	-6.58	-6.21	-7.74	1.53	-6.56
Mexico	-0.7	-1.35	-0.11	-1.24	0.34
Vietnam	-28.18	-15.94	-17.52	1.58	-16.05
Guatemala	-4.7	-2.57	-2.27	-0.3	-1.78
India	-5.12	-5.01	-8.35	3.34	-7.41
Ethiopia	-5.13	-7.19	-0.12	-7.07	0.88
Peru	-4.64	-4.65	-3.37	-1.28	-2.93
Nicaragua	0.82	2.33	-0.24	2.57	0.08
CostaRica	-0.96	-0.61	0.15	-0.77	0.7
Venezuela	2.26	2.24	-0.1	2.34	0.23
China	0.42	0.55	0.63	-0.08	1.99
UK	3.73	3.69	2.01	1.68	0.7
Japan	5.79	5.72	8.68	-2.96	-0.49
France	0.32	0.32	2.18	-1.86	0.02
Hungary	-0.24	-0.48	1.62	-2.1	0.51
Singapore	-89.59	-89.57	-87.41	-2.16	1.66
Thailand	-19.07	-19.08	-18.14	-0.94	-15.27
Italy	1.4	1.1	2.11	-1.01	0.45
Poland	2.82	2.81	0.92	1.89	0.28
Portugal	-0.62	-1	1.24	-2.24	-0.45
Cyprus	0	0	1.75	-1.75	1.75
Egypt	6.26	5.37	5.07	0.3	6.36
Denmark	-1.24	-1.16	0.69	-1.84	0.93
Romania	4.33	5.02	3.41	1.61	4
Ukraine	14.52	14.62	11.77	2.85	3
Russia	20.24	20.28	20.41	-0.13	3.24
USA	3.36	3.22	0.66	2.56	0.22
Turkey	-1.28	-1.21	-0.39	-0.82	0.33
Korea	13.22	13.66	16.28	-2.62	-2.64
Pakistan	1.92	2.03	3.55	-1.52	4.8
Germany	-0.33	-0.37	0.35	-0.72	0.08
Spain	3.77	3.75	4.55	-0.8	0.3
Australia	7.37	7.41	3.77	3.65	0.51
Greece	4.48	3.8	5.43	-1.64	1.63
Rest-Developed	-0.24	-0.23	0.57	-0.8	0.16
Rest-Developing	4.56	4.45	3.86	0.59	8.01
Rest-LDCs	-7.5	-7.62	-9.03	1.42	-2.01

Source: Results from Authors' simulations using GTAP 8 Data Base and Model

Table 4: Percentage changes in export shares for cotton textiles under different scenarios

Country	Total	TE-Cotton	Ct-S	Ct-N	Ct-S-S
Brazil	-17	-17	-11	-6	-1
Colombia	-39	-39	-25	-15	-12
Indonesia	15	15	11	4	18
Mexico	-22	-22	-2	-20	2
Vietnam	32	32	28	4	31
Guatemala	-18	-18	-13	-5	-7
India	19	19	10	9	17
Ethiopia	-3	-3	5	-8	12
Peru	-7	-7	-11	4	-2
Nicaragua	-19	-19	-16	-4	-4
CostaRica	0	0	-4	4	7
Venezuela	-34	-34	-30	-4	-15
China	15	15	8	7	17
UK	-1	-1	2	-3	-3
Japan	64	64	60	4	27
France	-1	-1	4	-6	-4
Hungary	-9	-9	-2	-8	0
Singapore	10	10	13	-3	-14
Thailand	23	23	12	11	20
Italy	-2	-2	1	-3	-1
Poland	-10	-10	0	-9	1
Portugal	-4	-4	2	-6	-1
Cyprus	2	2	8	-5	-8
Egypt	-7	-7	1	-8	4
Denmark	-7	-7	1	-8	0
Romania	-9	-9	0	-9	1
Ukraine	-11	-11	2	-13	-1
Russia	33	33	15	18	-5
USA	-4	-4	-2	-1	-10
Turkey	3	3	5	-3	-1
Korea	44	44	37	7	5
Pakistan	25	25	13	12	19
Germany	-7	-7	0	-7	-1
Spain	0	0	6	-6	-4
Australia	17	17	20	-3	1
Greece	-8	-8	-1	-7	-1
Rest-Developed	-8	-8	-1	-8	-1
Rest-Developing	-46	-46	-44	-2	-34
Rest-LDCs	-6	-6	6	-11	11

Source: Results from Authors' simulations using GTAP 8 Data Base and Model

All these changes in export shares may be explained by the changes in source-wise exports and the export shares of different sources in different destination markets. For example, Brazil has reasonably high TE and high export shares in both coffee and coffee production,

much more so in the former (table 2). As seen in table 5, Brazil faces an increase in exports which is high enough to off-set the world average rate of increase in exports, causing an increase in its export share. This can be partly explained by global import demand growth due to decline in import prices shown in table 5, though the market prices do not change sharply.

Another, more important aspect, is the substitution of exports from other sources by Brazilian exports. Tariff cuts by other countries on Brazilian exports are sharp enough to outweigh the tariff-cuts for other exporters. Table 6 shows the bilateral tariff structure, wherein it is evident that most of the tariff-cuts for Brazilian coffee products are deep and almost 100% with few exceptions like India and Mexico who actually raise tariffs, but do not matter much as their absorption of Brazilian exports is negligible to begin with (<0.1%). So, given their huge market shares to begin with, Brazilian coffee products end up being cheaper than those from other competitors and hence they expand their export shares.

On the other hand, Thailand too has considerable TE in coffee production sector as seen in table 6 and is a relatively small player, but it faces huge (four-fold) tariff increases from Indonesia, which absorbs 2% of its coffee product exports. Given that tariff cuts faced by Thai exports are not large enough to outweigh those faced by her competitors, Thailand suffers a major reduction of its coffee production exports and hence its export shares, also because it was a small player to begin with.

Similarly, for cotton textiles, China is a major player and has conspicuous tariff differences with cotton sector. Consequently, the tariff cuts are large and the resultant dataset has a larger export share for Chinese cotton textiles sector. Russia, being a smaller player in this sector and also with not so striking tariff differences facing its cotton and cotton textiles exports, gains far less in terms of its export share.

Given the Leontief assumption for the use of value added in production and full employment assumption, it is not surprising that sectoral employment and output move together as seen in table 5. In most cases output growth is in tandem with export growth. For the cases where it is not, it is due to the influence of imports, whose expansion or shrinkage causes output to shrink or expand, respectively.

Table 5: Percentage changes in key variables in Coffee Production (CofProd) and Cotton Textiles (CotTex) Sectors across the world

	Exports		Import Prices		Market Prices		Employment & Output	
Country	CofProd	CotTex	CofProd	CotTex	CofProd	CotTex	CofProd	CotTex
Brazil	4.3	-10.0	-4.1	-50.4	0.0	-1.5	1.2	-11.4
Colombia	3.6	-58.0	-6.1	-24.0	-0.2	-1.4	-0.2	-34.5
Indonesia	-4.8	44.0	-1.5	-16.3	0.1	-1.7	-0.8	4.4
Mexico	1.1	-101.8	-2.7	-8.4	-0.2	-0.2	0.0	-10.9
Vietnam	-26.4	115.8	-11.1	-56.0	3.4	-10.3	-16.4	-30.3
Guatemala	-2.9	-41.5	-3.0	-19.9	0.5	-2.1	-2.0	-43.2
India	-3.3	35.5	-9.3	-35.7	0.0	-0.2	-0.2	0.1
Ethiopia	-3.3	-28.4	-11.6	-83.2	-0.5	-1.8	-3.3	-91.4
Peru	-2.9	28.2	-5.5	-27.7	-0.1	-0.1	-0.7	-0.8
Nicaragua	2.6	-47.9	-4.6	-18.0	0.4	-1.0	0.5	-46.9
CostaRica	0.8	67.2	-4.0	-21.3	0.1	-1.1	0.2	-22.9
Venezuela	4.1	-62.7	-1.3	-27.9	-0.1	-1.5	0.3	-30.7
China	2.2	93.5	-8.9	-3.4	0.2	0.1	-0.5	11.3
UK	5.5	8.0	-0.5	-13.4	0.0	-0.5	0.3	-9.0
Japan	7.6	102.6	-3.9	-27.0	0.0	-1.1	-0.5	1.0
France	2.1	-14.8	-0.4	-7.0	0.0	-0.5	0.1	-9.4
Hungary	1.6	-28.1	-0.3	-4.0	-0.1	-0.4	0.5	-15.8
Singapore	-87.8	31.7	0.1	-0.7	0.0	0.0	-46.9	25.9
Thailand	-17.3	65.5	-11.9	-15.4	0.1	-0.5	-5.7	7.5
Italy	3.2	-13.9	-1.0	-6.7	-0.1	-0.4	1.6	-6.8
Poland	4.6	-22.5	-0.5	-3.8	0.0	-0.5	1.7	-12.4
Portugal	1.2	-15.2	-0.1	-2.9	-0.2	-0.4	0.4	-6.8
Cyprus	1.8	-5.3	-1.1	-10.4	0.0	-0.5	-0.9	-11.8
Egypt	8.1	-15.6	-37.6	-26.5	-0.3	-1.1	-8.2	-13.1
Denmark	0.6	-21.9	-0.4	-9.7	0.0	-0.7	0.3	-18.6
Romania	6.1	-31.9	-0.6	-1.9	0.2	-0.1	1.0	-15.6
Ukraine	16.3	20.7	-4.0	-14.2	0.0	-1.5	-1.4	-18.7
Russia	22.0	55.6	-6.5	-36.6	0.0	-2.6	-1.0	-15.0
USA	5.2	-1.2	0.0	-27.7	-0.1	-0.7	0.4	-13.8
Turkey	0.5	13.5	-11.5	-6.5	-0.1	-0.5	-1.0	-0.4
Korea	15.0	163.2	-15.9	-20.6	0.3	-1.2	-7.4	33.8
Pakistan	3.7	26.7	-8.1	-30.0	0.9	0.5	-2.2	6.1
Germany	1.5	-20.6	-0.7	-9.3	-0.1	-0.3	0.5	-16.5
Spain	5.6	-12.6	-0.4	-7.7	-0.1	-0.5	0.7	-9.7
Australia	9.2	109.5	-0.1	-21.6	0.0	-0.8	0.3	-10.6
Greece	6.3	-27.8	-0.3	-6.3	-0.2	-0.4	0.4	-12.6
Rest-Developed	1.6	-26.3	-0.8	-8.7	0.0	-0.7	0.3	-19.6
Rest-Developing	6.4	4.4	1.7	-15.5	0.0	-1.1	1.4	-14.4
Rest-LDCs	-5.7	2.0	-9.4	-31.4	-0.1	-2.5	-4.4	-34.1

Source: Results from Authors' simulations using GTAP 8 Data Base and Model

Table 6: Bilateral Tariff rates (in %) and % shocks (%shk) in Coffee and Cotton Sectors for select exporting countries across the world

	Brazilian Exports			Thailand Exports			Chinese Exports			Russian Exports		
	CofProd	Coffee	%shk	CofProd	Coffee	%shk	CotTex	Cotton	%shk	CotTex	Cotton	%shk
Brazil	0	0	NA	0	0	-100	17	0	-100	0	0	-100
Colombia	10	0	-100	0	0	-100	20	0	-100	8	0	-100
Indonesia	5	4	-27	0	2	400	7	1	-93	0	0	-100
Mexico	10	19	93	5	0	-100	15	0	-100	0	0	-100
Vietnam	0	0	-100	1	0	-100	23	0	-100	19	0	-100
Guatemala	0	0	-100	0	0	-100	10	0	-100	0	0	-100
India	15	48	212	27	1	-98	15	14	-5	6	0	-100
Ethiopia	0	0	-100	0	0	-100	32	0	-100	7	0	-100
Peru	0	0	-100	0	0	-100	19	9	-51	0	0	-100
Nicaragua	0	1	-100	0	0	-100	10	0	-100	0	0	-100
CostaRica	4	0	-100	0	0	-100	10	0	-100	0	0	-100
Venezuela	0	0	-100	0	0	-100	23	0	-100	0	0	-100
China	18	4	-79	3	0	-100	0	0	NA	3	0	-100
UK	8	0	-100	0	0	-100	7	0	-100	7	0	-100
Japan	10	0	-100	0	0	-100	4	0	-100	6	0	-100
France	8	0	-100	1	0	-100	9	0	-100	6	0	-100
Hungary	5	0	-100	0	0	-100	7	0	-100	6	0	-100
Singapore	0	0	-100	0	0	-100	0	0	-100	0	0	-100
Thailand	35	18	-50	0	0	NA	6	0	-98	0	0	-100
Italy	7	0	-100	0	0	-100	9	0	-100	7	0	-100
Poland	7	0	-100	0	0	-100	7	0	-100	6	0	-100
Portugal	6	0	-100	0	0	-100	8	0	-100	7	0	-100
Cyprus	6	0	-100	3	0	-100	8	0	-100	7	0	-100
Egypt	0	6	-100	0	0	-100	16	0	-100	9	0	-100
Denmark	8	0	-100	0	0	-100	7	0	-100	6	0	-100
Romania	17	7	-58	0	0	-100	6	0	-100	6	0	-100
Ukraine	4	0	-93	7	1	-90	8	0	-100	0	0	-100
Russia	9	4	-60	0	2	-100	15	0	-100	0	0	NA
USA	0	0	-100	0	0	-100	9	0	-100	10	0	-100
Turkey	46	25	-46	0	0	-100	6	0	-100	3	0	-100
Korea	33	12	-65	0	11	-100	6	1	-80	6	0	-100
Pakistan	0	0	-100	9	0	-100	17	5	-71	0	5	-100
Germany	11	0	-100	1	0	-100	7	0	-100	7	0	-100
Spain	5	0	-100	0	0	-100	8	0	-100	7	0	-100
Australia	0	0	-100	0	0	-100	7	0	-100	5	0	-100
Greece	7	0	-100	3	0	-100	9	0	-100	7	0	-100

Source: Results from Authors' simulations using GTAP 8 Data Base and Model

Table 7 shows the welfare results of the simulation for different scenarios. We found that the scenarios that removed TE merely in coffee products had no significant welfare effects for most of the countries. So this table shows the results for other scenarios alone. It is evident that TE in cotton sector is so much prevalent and significant across the world that the total global gain is about 770 million US$. Of this, 480 Million$ come from the removal of TE by all the developing countries and 276 million US$ come from the developed countries' action in this regard. However, when merely the developing countries remove TE among themselves and developed countries do not take any action, a global loss of 67 million US$ is possible.

China appears to be the biggest loser in terms of allocative efficiency in all scenarios that involve removal of TE by all developing countries, but it more than makes up in terms of huge terms of trade gains in every scenario. The allocative efficiency losses (equation 3) for China in arise from expansion of exports in the presence of distortions in the form of MFA quota rents as well as a major decline in the exports of non-cotton-textiles. Viet Nam is one of the biggest gainer in terms of allocative efficiency, mainly because of the expansion in cotton textiles exports triggered by the cuts in tariffs.

In the South-South liberalization scenario, developed countries are the main losers, while most of the developing countries except China gain in terms of allocative efficiency. China, India, Pakistan and Thailand gain in terms of trade effects in all scenarios, while Japan and Korea gain when the developing countries remove their TE against all of their exporters. One major observation from the welfare analysis is that most of the countries are better off if all of them remove TE in cotton and cotton textiles sectors. Contrary to common perceptions, even developed countries have immense scope of removing their tariff escalation in this sector.

Table 7: Overall Welfare Changes across the world: US$ Million

Country	Allocative Efficiency				Terms of Trade				Total Welfare			
	Total	Ct-S	Ct-N	Ct-S-S	Total	Ct-S	Ct-N	Ct-S-S	Total	Ct-S	Ct-N	Ct-S-S
Brazil	0	3	-2	3	-17	-18	1	-6	-17	-16	-1	-4
Colombia	9	10	-1	6	-13	-12	-2	-7	-4	-2	-2	-1
Indonesia	18	15	3	13	-4	-16	11	5	14	-1	14	18
Mexico	80	69	10	44	-31	-16	-15	-5	49	53	-4	39
Vietnam	287	284	3	199	-89	-90	1	-65	198	194	5	135
Guatemala	4	4	0	2	-10	-11	1	-4	-6	-8	1	-3
India	36	31	5	16	123	45	78	92	159	76	83	108
Ethiopia	5	5	0	4	-2	-1	0	-1	3	4	0	4
Peru	2	3	0	1	-2	-3	1	-1	0	-1	1	0
Nicaragua	2	2	0	2	-3	-3	0	-2	-1	-1	0	1
CostaRica	1	1	0	0	-1	-2	1	-1	0	-1	1	0
Venezuela	9	9	0	6	-1	0	0	-1	8	9	0	5
China	-289	-393	103	-482	673	566	107	804	384	173	211	322
UK	3	-5	8	-16	0	15	-15	-7	3	10	-7	-24
Japan	29	25	2	-10	124	142	-18	-7	153	168	-15	-17
France	7	7	0	-16	31	38	-7	-2	38	45	-8	-18
Hungary	-1	-1	0	-2	-4	-2	-2	-2	-5	-3	-2	-3
Singapore	1	1	0	-2	8	12	0	-13	9	13	0	-15
Thailand	-6	-1	-6	-8	41	10	32	36	35	9	26	28
Italy	18	-2	21	-16	2	29	-28	-7	20	26	-8	-23
Poland	0	0	0	-2	-1	-1	-1	0	-1	-1	-1	-2
Portugal	4	1	3	0	-5	2	-7	0	-1	2	-3	-1
Cyprus	0	0	0	0	0	0	0	0	0	0	0	0
Egypt	13	11	-1	7	-20	-16	-4	-12	-7	-5	-5	-5
Denmark	-2	0	-2	-2	-1	1	-1	-2	-3	0	-3	-3
Romania	-3	2	-4	-1	-25	-32	7	-15	-28	-30	3	-15
Ukraine	1	0	1	0	-2	-1	-1	-1	-1	-1	0	-1
Russia	0	-14	14	-8	6	4	2	-15	6	-10	16	-22
USA	136	48	88	-20	25	141	-117	-13	161	189	-29	-33
Turkey	11	-1	12	0	-7	19	-26	-8	4	18	-14	-8
Korea	-21	-34	9	-17	128	134	-4	16	107	100	4	-1
Pakistan	48	29	18	29	197	83	114	119	245	113	132	148
Germany	-17	0	-17	-26	7	39	-32	-8	-10	39	-49	-33
Spain	7	0	7	-8	10	24	-14	-11	17	23	-6	-19
Australia	7	-4	11	-7	-10	-1	-10	-3	-3	-5	1	-10
Greece	0	0	0	-2	-11	-3	-8	-2	-11	-3	-8	-4
Rest-Developed	-16	-18	1	-40	-26	20	-46	-19	-42	2	-45	-59
Rest-Developing	167	176	-9	99	-964	-981	15	-740	-797	-806	6	-641
Rest-LDCs	220	219	0	189	-128	-113	-14	-94	92	106	-14	95
Total	770	480	276	-65	-2	0	0	0	768	479	277	-65

Source: Results from Authors' simulations using GTAP 8 Data Base and Model

5. Conclusions

Tariff escalation is an important issue in the international trade policies of all countries. In our analysis, we find that this phenomenon exists in both developed and developing countries. Our research question is whether this affects the global export shares or not. Theory suggests that it should do so, because of the inefficiencies and resultant lack of competitiveness arising from excessive effective protection of the processing sectors.

Focusing on the raw material and processing parts of cotton and coffee sectors, we find that there is significant tariff escalation in most of the countries, particularly for the cotton sector. Using a modified version of the economy-wide multi-regional GTAP model and database, we analyze the results of different scenarios that remove the tariff escalation by bringing the tariffs in the processing sectors to the levels in the raw material sectors.

Our results show that tariff escalation does not reduce export shares directly, because the latter would depend on various other factors such as tariff differences across the sectors and countries as well as the structure and composition of the international trade flows. However, on a global level, removal of tariff escalation does raise the global average export shares.

In terms of regional and global welfare implications, TE in coffee is not significant, but TE in cotton turns out to be a dominant phenomenon. The complete global removal of TE in cotton and coffee has a potential to generate over 0.7 billion US$ of equivalent variations, which is a huge number, given that these are relatively small sectors in the global economy. Further, a scenario where most of the countries are better off is the one in which all countries remove TE in both cotton and coffee.

One policy implication from this study is to go for concerted global efforts to reduce tariff escalation in all countries together. While tariff escalation is almost always distortive, it is essential for each country to examine its relevance in their policy context, by accounting for the tariff differences and export shares in both the source and destination countries.

This is a very preliminary draft and more extensions are likely to be carried out in near future. For example, we could consider alternative scenarios such as complete tariff removal in all

the relevant sectors. It is also interesting to check the sensitivity of these results to the choice of elasticities.

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