How Tariffs Can Reshape the International Trade Flow: Evidence from Colombia

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1 Introduction

Trade barriers, such as tariffs, have been demonstrated to cause more economic harm than benefit; they raise prices and reduce the availability of goods and services, thus resulting, on net, in lower income, reduced employment, and lower economic output. Since the end of World War II, the world has largely moved away from protectionist trade policies toward a rules-based, open trading system. This widespread reduction in trade barriers has contributed to economic growth in many ways, including vast increases in trade activity and accompanying gains in economic output and income. However, one of the challenges in studying tariffs is that it is difficult to gauge the effect of tariff barriers among countries. Clearly, the way in which import demand responds to changes in tariffs will depend on a variety of factors. These factors include the reaction of producers and consumers to price changes, the share of imports in domestic production and consumption, how substitutable imports and domestic products are, and so on. The reaction to tariff levels will differ from country to country as well as from industry to industry and from commodity to commodity.

Tariffs are actually a type of excise tax that is imposed on goods produced abroad and depends on the time of import. They are intended to increase consumption of goods manufactured at home by increasing the price of foreign-produced goods. Generally, tariffs result in consumers paying more for goods than they would have otherwise in order to support the industries at home. Even though tariffs may afford some short-term protection for domestic industries that produce the goods subject to tariffs by shielding it from competition, they do so at the expense of others in the economy, such as consumers and other industries that pay the cost. As consumers spend more on goods on which the duty is imposed, they have less to spend on other goods. This way, one industry is subsidized to the disadvantage of all others. This results in a less efficient allocation of resources, which can then result in slower economic growth.

To further justify this viewpoint, we look at the wide proliferation of regional trade agreements (RTAs) across the world, which include free trade agreements (FTAs) and customs

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unions. The cumulative number of RTAs that had been reported to the General Agreement on Tariffs and Trade (GATT) since its inception in 1948 has been increased rapidly at the beginning of the 21st century. The spread of FTAs appears to have affected economic conditions in many countries, not only FTA members but also non-members, through the channel of foreign trade. There are two possible impacts that may be realized as a result of FTAs: trade creation and trade diversion. The trade creation effect means that the FTA eliminates trade barriers on trade flows among FTA members and, therefore, creates higher trade among them, while the trade diversion effect means that the FTA may replace imports of highly efficient non-member countries by imports from less efficient FTA members. Trade creation results in an improvement in resource allocation and economic welfare, while trade diversion can worsen the efficiency in resource allocation. Besides, trade diversion may have a negative impact on non-members as they may lose an exporting opportunity. While consumers in FTA members may increase welfare as the FTA enables them to buy imports at lower prices, an FTA member country in its totality may lose if the loss in government's tariff revenue overwhelms the consumers' gain.

One of the examples that fall into this group is the United States-Colombia Trade Promotion Agreement (CTPA), which is a bilateral free trade agreement between the United States and Colombia. Sometimes called the Colombia Free Trade Agreement, it was signed on November 22, 2006, by Deputy U.S. Trade Representative John Veroneau and Colombian Minister of Trade, Industry, and Tourism Jorge Humberto Botero, and entered into force on May 15, 2012. CTPA was a comprehensive agreement that supposed to eliminate tariffs and other barriers to trade in goods and services between the United States and Colombia, including government procurement, investment, telecommunications, electronic commerce, intellectual property rights, and labor and environmental protection.

According to the Office of the United States Trade Representative, Colombia was United States' 21st largest goods export market in 2018 with an export of $15.2 billion, up 13.3% ($1.8 billion) from 2017 and up 32.5% from 2008. In terms of imports, Colombia was US' 26th largest supplier of goods in 2018 with an import of $13.8 billion, up 1.7% ($221 million) from 2017, and up 5.3% from 2008. This means U.S. trade balance with Colombia shifted from a goods trade deficit of $178 million in 2017 to a goods trade surplus of 1.4 billion in 2018. At the same time, the United States is Colombia's leading partner, which is the destination of 28% of Colombia's export and the origin of 26% of Colombia's imports. This means this trade promotion agreement will affect Colombia's economy more severely than it might affect the U.S. economy. In this paper, I analyze the short-run effect of US-Colombia TPA in 2012 on Colombia's economy. According to CPTA, the tariffs on sectors metal and ores, infrastructure and machinery, transport equipment, autos and auto parts, building products, paper and paper products, and consumer goods become zero. What were the short-run effects on Colombia's economy? Classical trade theory dictates that the effects depend on the incidence of tariffs. Consumers and firms who buy foreign products gain from lower tariffs as the final price will be lower for them. Reallocations of expenditures into or away from domestic products induced by Colombia and bilateral tariff reduction may lead to changes in Colombia's export prices relative to import prices that is, terms-of-trade effects—and diminish tariff revenue. The trade agreement may have distributional consequences across sectors and thus across regions with different patterns of specialization. However, very little is known about tariff incidence, despite its central role in policy analysis.

In this article, I estimate the impacts of tariffs on Colombia trade quantities and prices. Due to the limitation on the availability of data my analysis considers short-run effects, but relative prices could change over longer horizons.

The remainder of the article is structured as follows. Section 2 looks at what has been done in previous studies in the literature. Section 3 summarizes the data used for the analysis and points out important observations in the data. Section 4 presents the empirical analysis and final results. Section 5 concludes and decribes the possible path for future research.

2 Related Literature

There is a vast literature that studies the effects of changes in trade costs or foreign shocks through empirical and quantitative methods. Eaton and Kortum (2002) creates a model that yields simple expression relating bilateral trade volume, first, to deviate from purchasing power parity and, second, to technology and geographic barriers. It solves the world trading equilibrium under the model they design, in order to examine how it changes in response to various policies (They develop and quantify a Ricardian model). Arkolakis, Costinot, and Rodríguez-Clare (2012) asks the question of "How large are the welfare gains from Trade?". They conclude that there are two sufficient statistics that welfare predictions in trade models need: (i) the share of expenditure on domestic goods (ii) an elasticity of imports with respect to variable trade costs. Autor, Dorn, and Hanson (2013) analyzes the effect of rising Chinese import competition between 1990 and 2007 on United States' local labor market, exploiting cross-market variation in import exposure stemming from initial differences in industry specialization and instrumenting for United States' imports using changes in Chinese imports by other high-income countries. Attanasio, Goldberg, and Pavcnik (2004) investigates the effect of drastic tariff reduction in the 1980s and 1990s in Colombia on some macroeconomic variable such as wage distribution. They find that trade policy has a key role in increasing return to college education, change in industry wages, and shift of the labor force towards informal sectors. Topalova (2010) uses the 1991 Indian trade liberalization to measure the impact of trade liberalization on poverty and examines the mechanism underpinning this impact (They look at the heterogeneity in liberalization intensity across production sectors). Kovak (2013) measures the effect of trade liberalization using a weighted average of changes in trade policy, with weights based on the industrial distribution of labor in each region. Dix-Carneiro and Kovak (2017) investigates the effect of trade liberalization on Brazilian local labor markets. They found regions facing larger tariff cuts experienced a prolonged decline in formal sector employment and earning relative to other regions. Goldberg et al. (2010) uses detailed trade and firm-level data from India to investigate the relationship between declines in trade costs, imports of intermediate inputs, and domestic firm product scope. They estimated substantial gains from trade through access to new imported inputs. Bustos (2011) studies the effect of a regional free trade agreement (MERCOSUR) on technological upgrading by Argentinian firms. Fajgelbaum, Goldberg, Kennedy, and Khandelwal (2020) investigates the effects of a sudden increase of tariffs on the U.S. economy. In 2018, the United States enacted several waves of tariff increases on specific products and countries and as a result, major trade partners retaliated. They analyze the short-run impact of this return to protectionism on the U.S. economy.

Import and retaliatory tariffs caused large declines in imports and exports. In this paper, I focus instead on trade policy, and tariffs in particular, because they are the primary policy instrument of the 2012 trade liberalization.

One of the approaches used to study the impacts of trade policy utilizes ex-post variation in tariffs across sectors to assess effects on sectors in one the papers mentioned previously: Attanasio, Goldberg, and Pavcnik (2004). A similar analysis was done for regions (e.g., Topalova 2010; Kovak 2013; Dix-Carneiro and Kovak 2017), firms (e.g., Amiti and Konings 2007; Goldberg et al. 2010; Bustos 2011), and workers (e.g., Autor et al. 2014; McCaig and Pavcnik 2018). One complimentary method uses quantitative models to simulate aggregate effects of tariffs, such as the Nash equilibrium of a global trade war (Ossa, 2014) or regional trade liberalizations (e.g., Caliendo and Parro 2015; Caliendo et al. 2015).

3 Data

This section describes the data, provides a timeline of key events, and presents an event study of the impact of tariffs. My primary data source covers daily import and export transactions from the Colombian Customs Office for the 2007–2013 period. This data set provides detailed information about each transaction. This information includes but not limited to the Harmonized System 10-digit product category (HS-10), partner country, importing and exporting firms in both countries participated in that transaction, F.O.B. (Free on Board) and C.I.F (Cost, Insurance, Freight) values for each transaction in terms of US dollars and Colombian Peso, freight, insurance, other possible costs during the shipping, quantities and unit of measurement for that quantity, weights. However, there is a difference between the import and export data set. There is some information that we can only find in the import data set, including value-added taxes, tariffs and tariff rates. Table I reports a summary of statistics for the Colombian import data set from 2007 to 2013.

Table I: Summary of Statistics - Imports

	Year						
Statistic	2007	2008	2009	2010	2011	2012	2013
F.O.B. Value (bil US$)	30.77	37.26	31.19	38.41	52.00	55.75	56.90
F.O.B. Value From US (bil US$)	8.052	10.76	9.02	10.03	13.02	13.49	15.81
Share of Insurance and Freight Costs (%)	7.6	6.8	5.5	6.1	5.1	5.2	4.9
Share of Insurance and Freight Costs From US (%)	6.5	6.5	4.8	4.9	4.4	4.3	4.2
Share of Insurance, Freight, Tariff and Tax Costs (%)	28.0	25.8	23.6	25.6	22.3	21.7	19.8
Share of Insurance, Freight, Tariff and Tax Costs From US (%)	23.3	22.7	20.2	21.6	18.2	17.2	13.4
No. of Imported Varieties	488,959	478,688	452,252	500,945	583,869	621,282	634,054
No. of Imported Varieties From US	118445	114982	103431	109507	122477	125448	122424
No. of Exporting Countries	210	219	213	216	213	221	224

Notes: The number of varieties defined as the number of country-importer-product combination imported by Colombia in a given year.

F.O.B., Free On Board, is a transportation term that indicates that the price for goods includes delivery at the Seller's expense to a specified point and no further. According to Table I, there is an increasing trend in F.O.B. values except in 2009. At the same time, the share of insurance and freight costs, which is the part of the C.I.F. values that are not covered in F.O.B values, is continuously decreasing from the United States and other countries in

total. Similar trends can be observed when the tax values and tariffs are added to the C.I.F values. In terms of F.O.B. values, around 25% of the imports are coming from the United States. The varieties defined here corresponds to country-importer-product combination imported from by Colombia in a given year, which has an increasing trend overall, but not in every year.

Table II reports a summary of statistics for some important variables for the Colombian export data set from 2007 to 2013.

Table II: Summary of Statistics - Exports

	Year						
Statistic	2007	2008	2009	2010	2011	2012	2013
F.O.B. Value (bil US$)	25.48	37.52	32.79	39.55	56.41	58.96	58.45
F.O.B. Value to US (bil US$)	8.75	14.00	12.87	16.75	21.59	21.41	18.37
Share of Insurance and Freight Costs (%)	1.3	1.3	1.2	0.8	0.6	0.6	0.7
Share of Insurance and Freight Costs to US (%)	0.5	0.7	0.6	0.4	0.2	0.2	0.3
No. of Exported Varieties	101,456	102,087	98,320	94,796	96,946	98,848	98,089
No. of Exported Varieties to US	12,583	11,709	11,492	10,673	10,354	9,937	10,316
No. of Exporting Countries	194	203	200	195	198	194	195

Notes: The number of varieties defined as the number of country-exporter-product combination exported by Colombia in a given year.

As mentioned before, the information about the tariff rates and other duties imposed on the shipments which could be different across different countries are not provided in this data set. Consequently, the trend of tax and tariffs are not reported in this table. Regarding F.O.B values and share of insurance and freight costs, similar trends with import data set can be seen in different years except for 2013 where there is a small decrease in total F.O.B values of exports and a noticeable decrease in the exports to United States' market. In contrast to what we have seen for imports, the number of varieties and the number of countries that Colombia exports to are diminishing every year, which could be a signal of Colombia losing some export markets.

In order to fill out the missing variables in the export data set, I collected the tariff rates that United States imposed on Colombian imports (or equivalently, tariff rates on Colombia's export to the United States) from TRAINS. The UNCTAD Trade Analysis Information System (TRAINS) is a comprehensive computerized information system at the HS-based tariff line level (HS 6-digit) which is reported by the world bank and provides data on trade control measures, including Tariffs, Para-tariffs, Non-tariff measures, and Imports by suppliers at HS 6-digit level. In order to make it more credible, a rough comparison of this data set was made with the tariff data provided by United States International Trade Commission (USITC) at HS-8 level and it seems the rates reported in both data set are quite similar. Finally, I used the Broad Economic Categories (BEC) classification that categorizes sectors according to their end-use. This data and its concordance with HS-6 level data are collected from UN Trade Statistics. Most of the analysis in this paper is done at the sector level. In order to create the sectors, I modified the classification provided by Pierce and Schott (2012) as indicated in Table III to avoid creating small sectors in terms of volume of trades.

Table IV uses the classification in Table III and provides detailed information about the

Table III: Import HS sections and Chapters

Sector	HS-2 Chapters
Animal & Animal Products	1-5
Vegetable Products	6-15
Foodstuffs	16-24
Mineral Products	25-27
Chemical & Allied Ind.	28-38
Plastics/Rubber	39-40
Raw Hides, Skins, Leather	41-43
Wood & Wood Products	44-49
Textiles	50-63
Footwear/Headgear	64-67
Stone/Glass	68-70
Metals	71-83
Electric Machinery	84-85
Transportation	86-89
Precision Instruments	90-92
Miscellaneous	93-97
Special Classification	98-99

volumes of transactions, share of the transactions from total shipments, number of products, and the average tariff rate for each sector in a given year. This table is created from Colombia's imported data set for years 2011 to 2013, to have at least a year window around the time the trade promotion agreement went into effect. This data records the values and quantities of trade flows at HS-10 level, which I refer to as products. From now on, I refer to the term country-product as varieties. According to Table IV, the total number of different products is 5225 in 2012 where 2664 of them are targeted in the TPA. In terms of volume, \$6.036 billion of the total \$14.072 billion imports from the United States was affected directly by the TPA (42.8%). Except for electric machinery, all the sectors have experienced an increase in the volume of imports from 2012 to 2013. Overall, consistent with Table I, the imports were increased from 2011 to 2013. The major part imports fall into the mineral products, chemical & allied ind., electric machinery, and transportation sectors, with the highest volume concentrated in mineral products sector. Colombia's largest export share is devoted to crude oil and coal which both fall into in mineral product sector. Tariff rates for each sector are specified at the end of Table IV, for 2011, 2012, and 2013. The tariff rate is divided into two different parts depending on whether the shipment took place before or after the implementation of the CTPA. The numbers reported for each sector each year are simply the average over the rates imposed on different products in those sectors. However, the average total tariff rate imposed on imports reported in the last row of Table IV is a weighted average over tariff rates of each sector with weights equal to the volume of trades in those sectors. The results indicate that the average tariff rate is immediately decreasing after the implementation of the trade promotion agreement, followed by a further decrease in the next year. The largest decreases are among the targeted sectors, while the changes in

tariff rates for untargeted sectors are mostly decreasing too.

Table V provides the information about the volumes of transactions, share of the transactions from total shipments, number of products, the variation in tariff rate changes for each sector in a given year for export varieties. The first thing one can notice is that the numbers of varieties exported from Colombia to the United States are smaller than what is imported from the United States to Colombia. However, the volume of exports to the United States is bigger than what is imported from there. This decreasing trend is quite surprising is quite extreme with an almost $3 billion decrease from 2012 to 2013. This huge decrease mostly comes from mineral products and metals sectors. Tariff rates are already zero in most sectors. Therefore, looking at the overall average rate is not going to be quite informative, but is it worth mentioning that the average tariff rate is decreasing from 2012 to 2012. At the first glance, these tariff rates seem quite unusual mostly for the sectors where the tariff rate is quite high; e.g. Foodstuff, Animal & Animal Products, Textiles, and Footwear/Headgear. Even though openness to trade and investment has substantially contributed to the United States' growth, the United States still maintain duties against several categories of goods. The highest tariffs are concentrated on agriculture, textile and footwear, where the United States has the most protective policy.

In order to visualize the sector variation in tariff rate changes for import varieties, I plotted Figure I and Figure II using the data employed for Table IV. Similarly, sector variation in tariff rate changes for export varieties is plotted in Figure I and Figure II using the data employed for Table V. The results are similar to what has been discussed for Table IV and Table V.

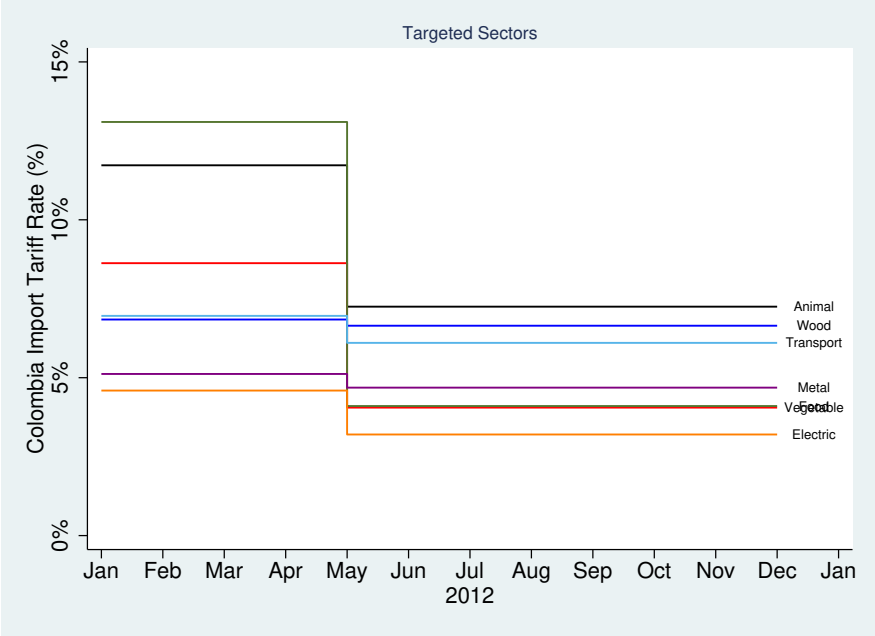


Figure I: Tariff rates on targeted Colombia's imports from US

Each line corresponds to a sector, and the part before the breaking points in May is the average of tariff rates for the corresponding sector from 2011 to May 2012, and the line after breaking point is the average of tariff rates from May 2012 till the end of 2013. For import

Table IV: Sector Variation In Tariff Rate Changes For Import Varieties

	# Products			2011 Imports		2012 Imports		2013 Imports		Tariff Rate (%)			
Sector	2011	2012	2013	(mil US$)	(%)	(mil US$)	(%)	(mil US$)	(%)	2011	2012 (Before May 15)	2012 (After May 15)	2013
Animal & Animal Products	82	103	100	42	0.3	77	0.5	173	1.1	11.3	12.7	7.8	7
Vegetable Products	211	226	224	682	5	504	3.6	689	4.2	8.5	9.2	4.4	3.8
Foodstuffs	208	210	210	295	2.2	431	3.1	592	3.6	13	13.4	4.9	3.7
Mineral Products	133	119	126	2,601	19.1	3,861	27.4	5,119	31.1	3.6	2.2	1.8	1.9
Chemical & Allied Ind.	982	976	990	2,279	16.8	2,315	16.4	2,504	15.2	6	5.2	4.3	3.9
Plastics/Rubber	285	284	291	830	6.1	867	6.2	906	5.5	8.7	8.4	8.1	7.8
Raw Hides, Skins, Leather	37	34	36	3	0	4	0	7	0	13.2	13.5	11.9	10.4
Wood & Wood Products	220	225	228	287	2.1	259	1.8	279	1.7	6.9	6.7	6.9	6.5
Textiles	541	518	509	279	2.1	198	1.4	244	1.5	12.2	11.5	10.1	5.3
Footwear/Headgear	46	45	40	7	0.1	6	0	13	0.1	13.6	13.6	13.4	15.2
Stone/Glass	142	144	142	58	0.4	63	0.5	68	0.4	5.7	5.2	4.9	4.5
Metals	596	596	591	486	3.6	526	3.7	490	3	5.1	5.1	4.9	4.5
Electric Machinery	1,138	1,125	1,126	3,005	22.1	2,952	21	2,675	16.2	4.8	4	3.5	3
Transportation	176	179	180	2,048	15.1	1,287	9.1	1,967	11.9	7	6.8	6.7	5.8
Precision Instruments	258	257	247	535	3.9	568	4	588	3.6	4	2.7	2.2	1.8
Miscellaneous	181	180	179	142	1	147	1	151	0.9	11.6	12.2	11.2	10.8
Special Classification	4	4	3	8	0.1	8	0.1	7	0	11.8	12.1	11.2	10.8
Total	5,240	5,225	5,222	13,587	100.0	14,072	100.0	16,472	100.0	6.0	5.0	4.1	3.7

Notes. Panels display unweighted monthly HS-10 country average tariff rates. 2011 and 2013 tariff rates are computed as the annual average; 2012 tariff rates are computed using data from January 2012 to April 2012 and May 2012 to December 2012. Total tariff rates are computed as the trade-weighted average of table row values. The denominator for import share is the total annual US$ value of all Colombian imports from U.S. (C.I.F. Values). The promotion agreement entered into effect on May 15 but I considered the beginning of May for simplification. See the text for data sources.

Table V: Sector Variation In Tariff Rate Changes For Export Varieties

	# Products			2011 Exports		2012 Exports		2013 Exports		Tariff Rate (%)		
Sector	2011	2012	2013	(mil US$)	(%)	(mil US$)	(%)	(mil US$)	(%)	2011	2012	2013
Animal & Animal Products	42	48	44	39	0.2	46	0.2	53	0.3	109	120.8	80
Vegetable Products	114	123	128	2,304	10.6	2,061	9.6	2,117	11.5	0	0	0
Foodstuffs	132	127	138	270	1.2	287	1.3	251	1.4	326.5	317.7	293.3
Mineral Products	36	45	42	15,937	73.7	15,119	70.4	13,073	71	0	0	0
Chemical & Allied Ind.	169	170	186	100	0.5	100	0.5	127	0.7	0	0	0
Plastics/Rubber	112	107	120	166	0.8	152	0.7	130	0.7	25	25	0
Raw Hides, Skins, Leather	36	40	36	59	0.3	57	0.3	62	0.3	19.1	21	0
Wood & Wood Products	98	94	92	33	0.2	26	0.1	17	0.1	0	0	0
Textiles	298	317	293	238	1.1	235	1.1	257	1.4	77.9	73.5	0
Footwear/Headgear	36	33	39	3	0	3	0	3	0	119.2	133.3	65
Stone/Glass	62	58	62	80	0.4	88	0.4	81	0.4	0	0	0
Metals	212	191	206	2,213	10.2	3,067	14.3	2,002	10.9	0	0	0
Electric Machinery	481	409	455	116	0.5	133	0.6	152	0.8	0	0	0
Transportation	67	57	69	11	0.1	16	0.1	19	0.1	0	0	0
Precision Instruments	111	106	113	13	0.1	14	0.1	18	0.1	0	0	0
Miscellaneous	92	86	80	53	0.2	55	0.3	49	0.3	1.9	5.9	0
Special Classification	2	2	2	2	0	3	0	3	0			
Total	2,100	2,013	2,105	21,638	100.0	21,463	100.0	18,415	100.0	5.4	5.6	4.2

Notes. Panels display unweighted monthly HS-10 country average tariff rates. All tariff rates are computed as the annual average. Total tariff rates are computed as the trade-weighted average of table row values. The denominator for export share is the total annual US$ value of all Colombian exports to U.S. (C.I.F. Values). The promotion agreement entered into effect on May 15 but I considered the beginning of May for simplification. See the text for data sources.

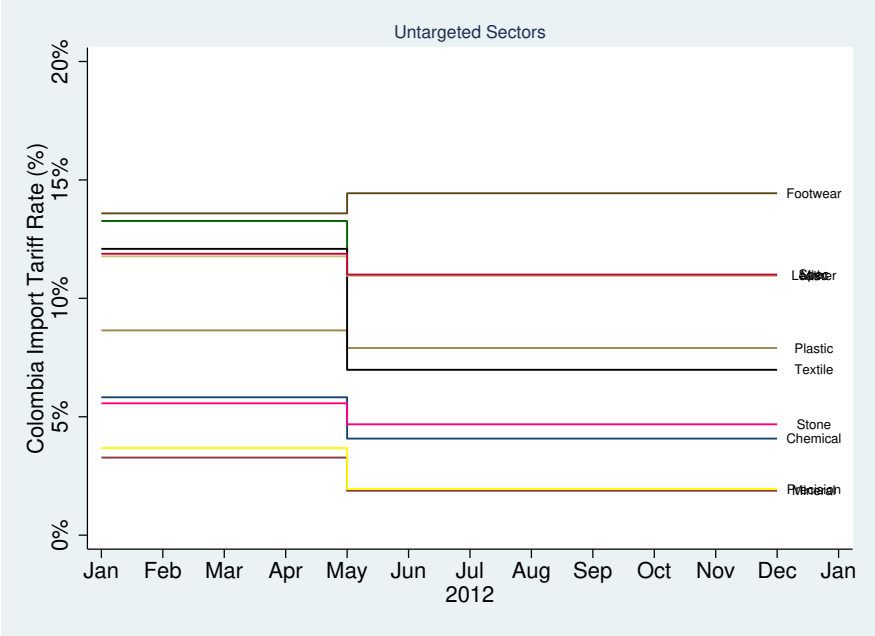


Figure II: Tariff rates on untargeted Colombia's imports from US

varieties, all the sectors face a decrease in the tariff rate except the footwear/headgear sector where there is a slight increase in the tariff rate. The biggest decrease in average tariff rates is in the animal & animal product sector, which is among the targeted sectors in the CTPA. Even though the average rates defined here is different from what we defined for Table IV

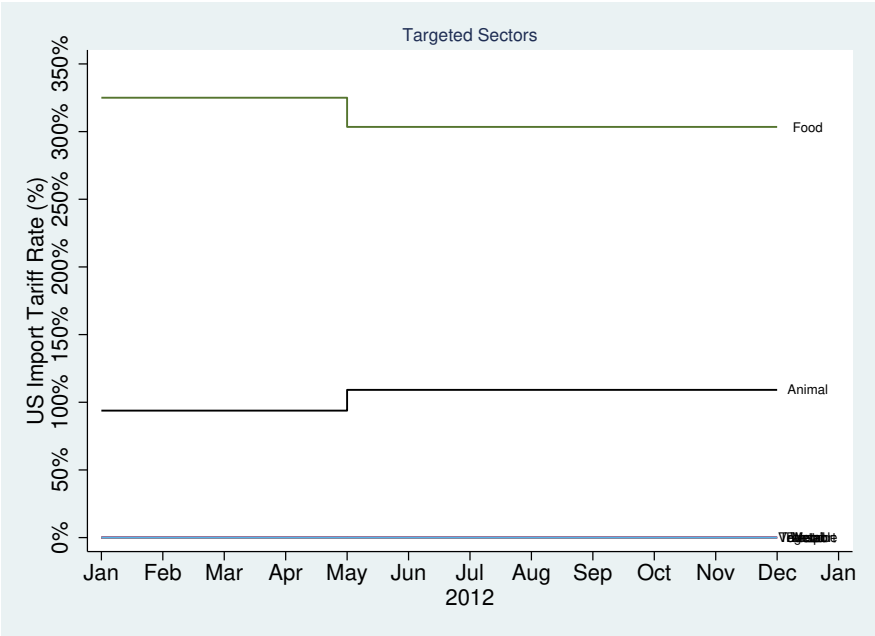


Figure III: Tariff rates on targeted Colombia's exports to US

and Table V, the directions of tariff rate changes are the same for the most part. On the

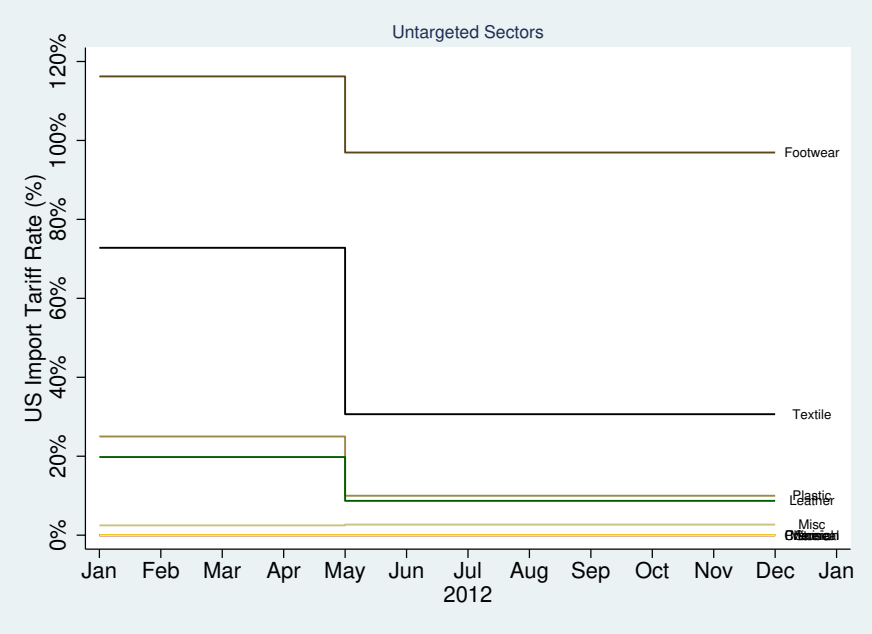


Figure IV: Tariff rates on untargeted Colombia's exports to US

export side, even though the tariff rates are generally decreasing, except the ones that are already zero, the tariffs imposed on Colombian exports are quite high in some sectors. This is still consistent with the results in Table V, where we can see a high tariff rate in those sectors between 2011 and 2013.

To further explore the possible effects of tariff reduction, I used Broad Economic Categories (BEC) classification to group commodities according to their main end-use.

Table VI: Targeted Imports, Intermediate vs. Final Goods (2012)

	Targeted Colombian Imports From US			Total Colombian Imports From US		
Product Type	# HS-10	mil USD	Δ Tariff	# HS-10	mil USD	Δ Tariff
Intermediate/Capital Good	2,127	5,575	-0.5	4,134	13,151	-0.4
Final/Consumer Good	537	460	-6.7	1,091	921	-4.6
Total	2,664	6,035	-0.8	5,225	14,072	-0.6

Table VII: Targeted Exports, Intermediate vs. Final Goods (2012)

	Targeted Colombian Exports to US			Total Colombian Exports to US		
Product Type	# HS-10	mil USD	Δ Tariff	# HS-10	mil USD	Δ Tariff
Intermediate/Capital Good	497	4,076	12.3	858	19,594	3.2
Final/Consumer Good	218	1,562	30.1	558	1,869	32.2
Total	715	5,638	15.4	1,416	21,463	6.4

Table VI reports the results of categorization for the import data set, including the number of products, volumes of trade, and change in tariff rates for targeted and total

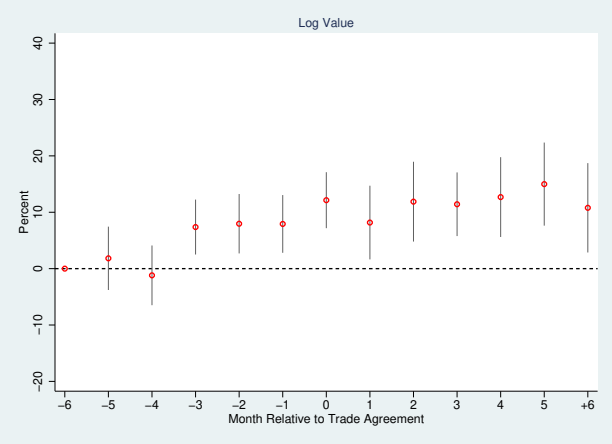
imports from the United States. Table VII provides the results for the same variable for Colombia's export to the United States. The change in tariff rate changes reported in both tables is the immediate tariff rate change after the implementation of the CTPA. The biggest portion of Colombia's imports and exports is intermediate goods. On average, there is a higher tariff reduction applied to consumer goods in Colombia's imports, which forms a smaller portion of imports. However, on the export side, the change in the tariff rate is positive, which means there has been an immediate increase in the tariff rates both for targeted and total exports. However, there is no inconsistency with previous results as they have a different measure of average. The increase in duties imposed on exports is only an instantaneous response and follows by a decrease in 2013. One thing that we should keep in mind is that tariff rates imposed on Colombia's export by the United States are zero for the most part, while there is an excessive tariff imposed on a number of sectors. Consequently, the average becomes uninformative for the export side.

4 Event Study

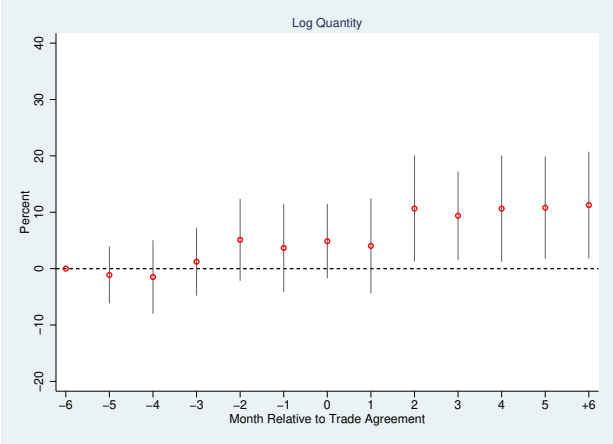
In order to visualize the effects of the trade promotion agreement on trade, we define the following event study framework. To assess the impacts, I compare the trends of targeted varieties (those products that directly affected by a tariff decrease) to varieties not targeted using the following specification:

$$\log y_{igt} = \alpha_{ig} + \alpha_{it} + \alpha_{gt} + \sum_{j=-6}^{j=6} \beta_{0j} I(event_{igt} = j) + \sum_{j=-6}^{j=6} \beta_{1j} I(event_{igt} = j) \times target_{ig} + \varepsilon_{igt}$$

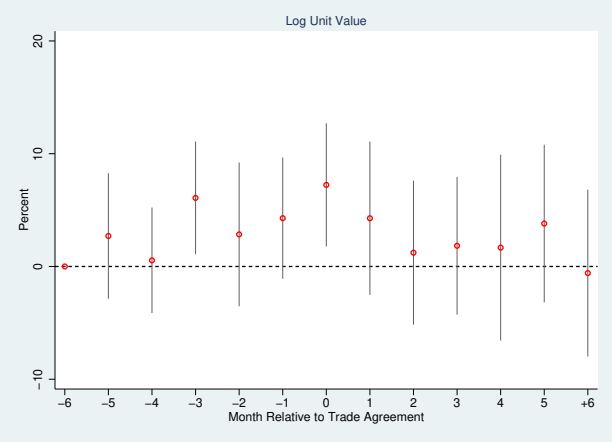
This estimation includes county-product or variety (α_{ig}), country-time (α_{it}), and product-time (α_{gt}) fixed effects. $tariget_{ig}$ is a dummy variable that captures the effect of varieties targeted by tariffs. The β_{1j} coefficients are identified using the difference between targeted and non-targeted varieties in product-time as we included α_{gt} fixed effect in our estimation. The indicator variables capture the effect of event time coefficients. For the estimation, I assign the event date of both targeted and non-targeted varieties to be the nearest full month to the actual event date, using the 15th of the month as the cutoff date. As all the tariff reductions entered into effect at the same time on May 15, the event time coefficient cutoffs are the same among all varieties. I binned the observations for event times of 6 months or more after the CTPA into one group and excluded all the observations that are 7 months are more before the CPTA. For the import outcomes, standard errors are clustered by country and HS-8, since these are generally the levels at which the tariffs are set. For the export outcomes, standard errors are clustered by HS-6 and country; here, I use HS-6 because that is the finest level at which product codes (in the harmonized system) are comparable across countries and the level at which I merged the tariff rates on Colombia's export to the export data set which is reported by Colombia itself. I plot the β_{1j} dummies which capture the relative trends observed for targeted varieties. Figure V reports the impacts on imported varieties.



(a) Log Value of Imports



(b) Log Quantity of Imports



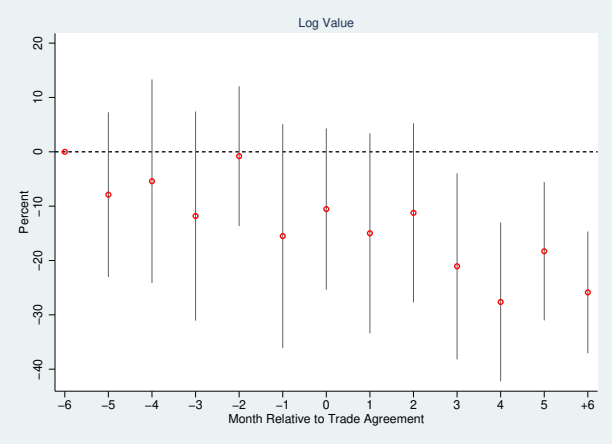
(c) Log Unite Value of Imports

Figure V: Variety Event Study: Imports

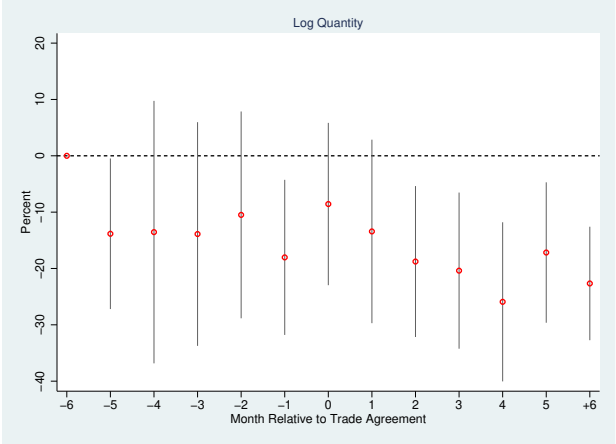
Figure plots event time dummies for targeted varieties relative to untargeted varieties. Estimations include country-product, product-time, and country-time fixed effects. Standard errors are clustered by country and HS-8. Event periods before -6 are dropped, and event periods ≥ 6 are binned together. Error bars show the 95% confidence intervals. Sample period: 2011:1 to 2013:12.

The top two panels trace the impact of tariffs on log import values and log quantities, and the bottom panel shows the effects on log unit values. Close to the impact, we detect a large increase in imports. Import values increase on average by 10% and increase decline by 8%. At the bottom of the panel, while the unit values do not change as the increase observed is not significant. These three panels provide initial evidence of complete pass-through of the tariffs to import quantities and not prices at the variety level. Figure V reveals anticipatory effects occurring before the tariff changes, and they are quantitatively close to what is observed after the implementation of the CTPA, which may come from the fact that importers shifted forward their purchases to paying less tariffs.

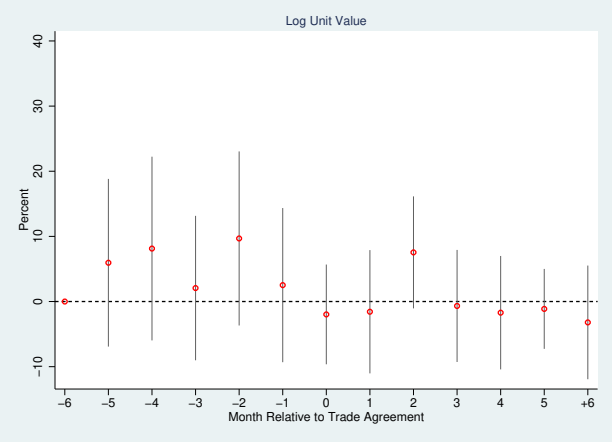
Figure VI reports the impacts of CTPA tariffs reduction on Colombia's exports. The pattern is quite different from what we observe for imports. I find that the export values decline on average by 20% and quantities fall by 18%. Again, we observe no change in



(a) Log Value of Exports



(b) Log Quantity of Exports



(c) Log Unite Value of Exports

Figure VI: Variety Event Study: Exports

Figure plots event time dummies for targeted varieties relative to untargeted varieties. Estimations include country-product, product-time, and country-time fixed effects. Standard errors are clustered by country and HS-6. Event periods before -6 are dropped, and event periods ≥ 6 are binned together. Error bars show the 95% confidence intervals. Sample period: 2011:1 to 2013:12.

the unit values, suggesting a complete pass-through of the reduction of tariffs to foreigners' imports of Colombia's varieties. What we expect to see after a trade agreement between is an increase in the trade flows as what we observed for import data set. However, it is not the case for Colombia's exports. Not only we don't see an increase in the exports, but also there is a significant decrease in the volume of exports which mainly comes from the decrease in the quantities, while the prices stay the same during the time window of our study. Several concerns need to be pointed out here. First, the tariff rates imposed by the United States on sectors that form the major part of Colombia's export to the United States is zero, including mineral products, vegetable products, and metals. So, the big decrease in the export of these sectors is not justified with what we see in the tariff rate changes. Second, we check for the changes in coal and crude oil prices to see whether a shock was observed causing these unusual results. Figures VII and VIII report Colombian crude oil and coal prices, collected

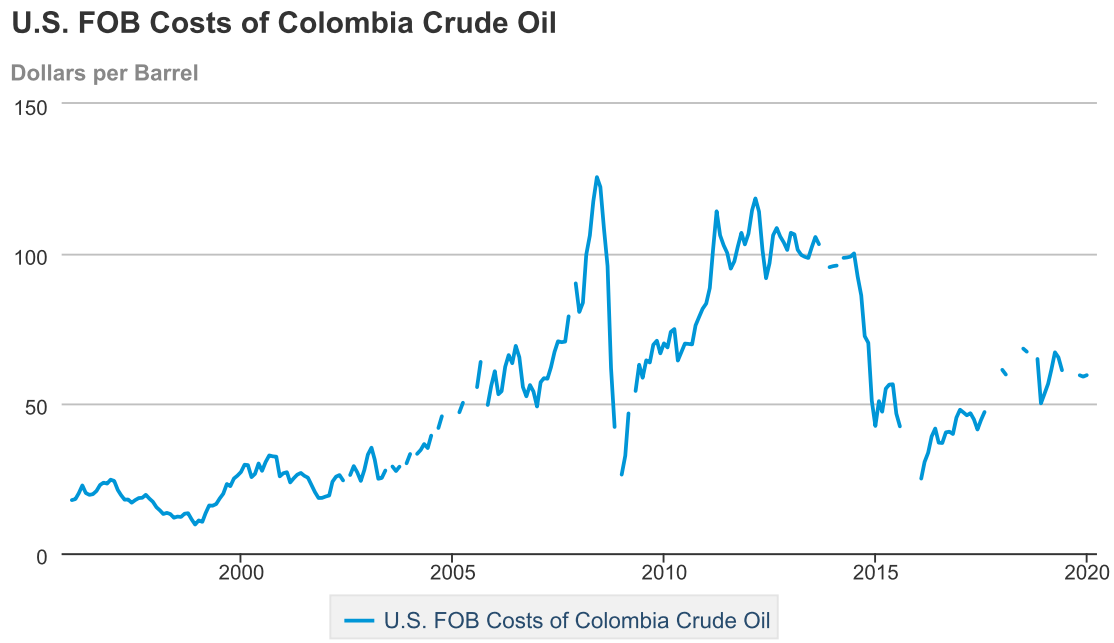


Figure VII: Colombian Crude Oil Price

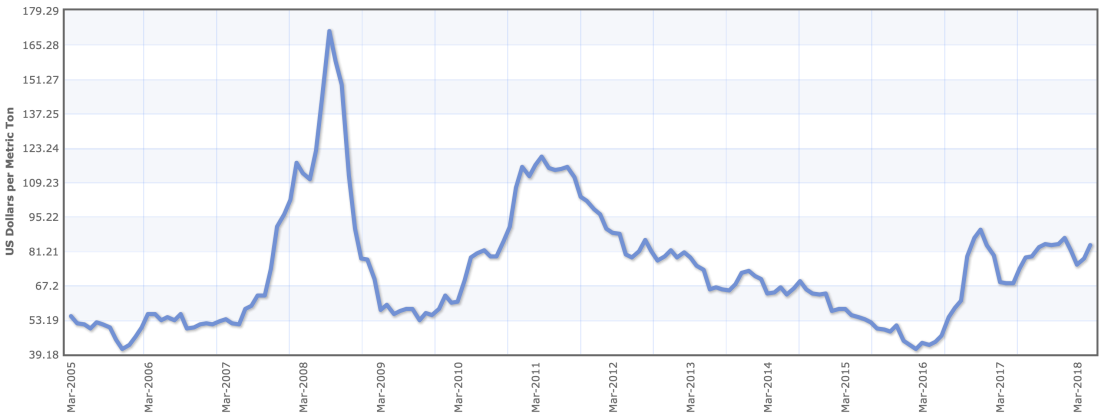


Figure VIII: Colombian Coal Price

from the United States. Energy Information Administration and IndexMundi, respectively. Regarding the oil prices, there is a limited variation in the prices while we see a decrease in coal prices. The next thing we have to take into account is that the total export of Colombia to the rest of the world remains unchanged from 2012 to 2013. Besides, Colombia's GDP was $381.9 billion in 2013, which is the highest GDP recorded for Colombia's history. One possible explanation can come from the change in demand for Colombian products in the United States' market, which requires separate data on U.S. household consumption and industry inputs for 2012 and 2013. In order to make this additional step reasonable, we need

to keep track of changes in exports from all the sectors in Colombia to the rest of the world and monitor the diversion of exports to the U.S. market from the rest of the world. Because of the limited amount of time, we skipped his step. As mentioned before, the total Colombian exports slightly increased from 2012 to 2013. What we expect to see is that there has been an improvement in some sectors where the total exports increased, while some sectors such as mineral products and metals took a hit and had lower export during this period so that the total export could remain unchanged. The reason we believe this can be the case is that the activity of the Revolutionary Armed Forces of Colombia—People's Army made 239 attacks on the energy infrastructure in 2012. Destruction of energy infrastructure can easily reduce the production in energy-related sectors, in addition to other sectors that use the energy-related sectors' output as their input and a further decrease in the total output. The products which fall into metal sectors are the ones that usually need a high energy input for production. The energy-related companies fall into the mineral products sector, and according to Table V, these two sectors, which are the main exporters to United States, took the hit, while the vegetable products, which is the third major exporter to the United States, was not affected. Note that while the vegetable product sector was not affected by this external shock, the increase in the exports is quite low. Again, this observation is consistent with what we found in Table VI and Figure III, where the tariff rates imposed by the United States on Colombian products were zero, before and after the CTPA. Accordingly, the vegetable products sector already had the advantage of low final costs for exporting to the United States' market and were not affected by the CTPA similar to other sectors.

5 Conclusion

In this paper, I analyzed the impact of the United States-Colombia Trade Promotion Agreement (CTPA) on Colombia's imports and exports. As the tariff rates imposed bu Colombia on US products changed more severe than the tariff rates imposed by the US on Colombian Products, trade flows entering Colombia were affected more compared to the trade flows entering the United States. The variation in tariff rate changes across imports and exports simply comes from the fact that tariff rates imposed by the United States on Colombian goods were already zero in most sectors and consequently, those products were barely affected by the CPTA. At the time of implementation of the CTPA, Colombia experienced an internal shock, which resulted in destruction and lower production of some sectors. As this shock had an opposite effect on Colombia's economy compared to the CTPA, the effect of tariffs on trade flows cannot be directly observed from the export perspective. However, the partner country was not affected by the shock Colombia experienced in terms of production as it was described in section 4. Therefore, we can see a complete pass-through of tariff rates to trade flows entering Colombia.

All the analyses I did in this paper can be used as the groundwork for analyzing the effect of removing a trade barrier on Welfare. Due to the limitation of data availability on Colombia's imports, I was only able to do a short-run study on the impacts of the stated trade agreement on trade flows. Consequently, extending the study here to derive the welfare gain achieved under this trade agreement will also result in a short-run impact. Be that as it may, the next step would be estimating the import demand in Colombia and elasticities of

substitution across origins within a product, across imported products, and between domestic goods and imports within a sector. However, we need to have data on the wage distribution of workers in Colombia for this period.

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