The Effect of Trade Agreements on Trade Margins: Firm-Level Evidence from Colombia

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Abstract

Using a Colombian firm-level export data set this paper analyzes the short-run effect of Colombia entering into multiple Preferential Trade Agreements (PTAs) from 2007-2013. Implementing a difference-in-differences estimation this paper finds that a reduction in uncertainty over future tariffs, defined as switching from revocable Generalized System of Preferences (GSP) tariffs, to permanent preferential tariffs, increases the probability a firm exports a product (extensive margin) and a firm's export volume (intensive margin) to a PTA partner country relative to products that do not see any change in tariff uncertainty. For the average firm-product-destination the switch from GSP tariffs to permanent preferential tariffs increases the probability of exporting by 3 percentage points, and increases a firm's export volume by 9%. Meanwhile a reduction in non-zero tariffs to lower preferential tariffs only increases the intensive margin.

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1 Introduction

This paper analyzes two separate effects on trade margins when Preferential Trade Agreements (PTAs) enter into force: i) a reduction in uncertainty in future tariffs and ii) a reduction in applied tariffs due to the new preferential tariffs. For the reduction in uncertainty, I make use of the switch from Generalized System of Preferences (GSP) tariffs, to a permanent preferential tariff of zero due to the agreement. The new preferential zero tariff, unlike the GSP tariff, can not be revoked.

The extensive margin of trade is defined, in this paper, as the probability a firm, exports a product, to a destination, in a given time period. The intensive margin is the export volume by product-destination for a firm in a given time period. The main result is that a reduction in tariff uncertainty increases both the extensive and intensive margins of trade.

The GSP tariff, is a tariff of zero on eligible products made in eligible developing countries such as Colombia. Developed countries, such as the United States and Canada, give this tariff concession to various developing countries, but have the ability to revoke the GSP elgibility and the accompanying tariff of zero. If the GSP eligibility is revoked, the new tariff on Colombian exports will be the Most Favored Nation (MFN) tariff, which is set by importing countries within the rules of the World Trade Organization (WTO). The MFN tariff is the tariff set on almost all[1] imported products that are not granted the zero GSP tariff. After Colombia enters into a PTA, Colombian exports no longer face the MFN or GSP tariff, but rather the preferential tariff. For the case of GSP eligible products, the preferential tariff is still zero.

I make use of the gap between the GSP tariff and the MFN tariff that would be applied to Colombian exports if an importing country revoked GSP eligibility, as the measure of trade policy uncertainty.

Previous papers have analyzed the extensive margin in differing manners: the probability a firm exports a product (Fontagné et al., 2015), the number of firms exporting (Buono and Lalanne, 2012), the probability a product is traded (Handley, 2014), the number of products traded (Dutt et al., 2013), or various measures of the percentage of all potential products traded (Baier et al., 2014). This paper is able to define the extensive margin as the probability that a firm exports a product to a destination. Assuming that firms produce varieties that are unique to the firm for a given product, looking at the probability a firm exports a product has different welfare implications than

[1] Anti-dumping and safeguard tariffs allow for importing countries to legally set tariffs above the MFN tariff, but these affect a small percentage of imported products

the probability that a product is exported. For example the change in definitions of the extensive margin distinguishes between if a product is exported by only one firm, or if two firms export their own varieties of the same product. An analysis looking at the probability a product is exported misses out on some of the gains from trade. The firm-level data distinguishes the results in this paper from previous research looking at the extensive margin.

This paper also differs in how it analyzes changes in tariffs. Handley (2014), Dutt et al. (2013), and Buono and Lalanne (2012) all look at reductions in tariffs resulting from WTO negotiations. Instead of analyzing global tariff reductions this paper specifically looks at PTAs. However, like Handley (2014) this paper investigates the the important role that the reduction in uncertainty plays in promoting trade. In terms the role of reductions in trade policy uncertainty Handley (2014) and Handley and Limão (2015) are two of the closest related papers.

Breaking from other papers investigating trade margins, this paper uses a difference-in-differences strategy to estimate the role that trade agreements play in influencing trade margins. Previous work has often relied on gravity equations, or were able to estimate a linear probability model (LPM) without resorting to a diff-in-diff approach. However for this paper, products are affected differently by trade agreements and therefore each of these groups need to be analyzed. The benefit of the diff-if-diff approach is that it controls for other trade promoting affects of PTAs. Trade agreements do more than change tariffs, they change can customs procedures, relax FDI requirements, etc.

The diff-in-diff estimation strategy allows for a comparison of the previously mentioned two groups of products: i) products that switch from a GSP tariff of zero to a permanent PTA tariff of zero (and therefore have a reduction in trade policy uncertainty), and ii) products that receive a preferential tariff cut, to a control group of products that did not receive a preferential tariff cut, nor were GSP eligible. This control group only experienced a change in non-tariff barriers (NTBs). All products experienced a reduction in NTBs, which is expected to increase trade. Without a comparison to the control group, an increase in trade attributed to a reduction in uncertainty could actually be a result of a reduction in NTBs. The diff-in-diff approach allows me to isolate the affect of a reduction in uncertainty.

The results of the paper are two-fold: i) a reduction in trade policy uncertainty, as defined as switching from GSP tariffs to PTA tariffs, is important for both the extensive and intensive margins, the probability a firm exports a product to a destination increases by 3 percentage points, while volume increases by 9%, on average, and ii) a reduction in applied tariffs is important for

only the intensive margin.

The first result is in line with Handley (2014) which used reductions in tariff binding for Australian imports. Handley (2014) found that products which saw larger decreases in tariff overhang (the amount of room an importer has to legally raise applied MFN tariffs under WTO rules) had an increased probability of being exported by a country to Australia. By Australia having less ability to increase tariffs in the future, while simultaneously leaving the applied tariff unchanged, Handley (2014) was able to isolate the effect of a reduction in trade policy uncertainty.

The importance of switching to permanent tariffs, even when there was not change in the applied tariff, also fits with Autor et al. (2013) and subsequent work dealing with the United States granting China permanent normal trade relations (PNTR). The granting of China PNTR reduced the uncertainty over future tariffs on Chinese goods. Work on the aftermath of granting China PNTR has been continued by Pierce and Schott (2016) and Handley and Limão (2017). This paper defines trade policy uncertainty as the difference between one-way preferential GSP tariffs (almost always set at zero) granted to Colombia by the United States and Canada, and the MFN tariff on the product. GSP tariffs need to be renewed by Congress in the United States and countries can also lose GSP status. For example Argentina lost GSP status in 2012 (the same year the Colombian-United States PTA went into force).

The second result of reductions in tariffs having little affect on the extensive margin is in agreement with previous work. For example Debaere and Mostashari (2010) find that tariff reductions in the United States had little effect on the country-product extensive margin. Baier et al. (2014) find that trade agreements have a larger short-term affect on the intensive margin, and that the effect of a trade agreement on extensive margin takes longer to materialize. Due to the data limitations of this paper, the medium- and long-run effects of trade agreement on the extensive margin can not be investigated. The finding that the extensive margin is of little importance for changes in tariffs is also seen in Buono and Lalanne (2012).

This paper provides firm-level evidence that reductions in tariff uncertainty play an important role in increasing both the intensive and extensive firm-product trade margins.

2 Theories of Exporting under Trade Policy Uncertainty

The contribution of this paper is empirical in nature, but this section will briefly discuss the theoretical models of Handley (2014) and Handley and Limão (2015); in fact Handley (2014) builds

off of the model in Handley and Limão (2015). These papers are specifically on reductions in trade policy uncertainty.

Handley (2014), although an extension that captures the role of WTO tariff bindings, is not as applicable to this paper. WTO tariff bindings are the maximum tariffs that can be set by WTO members on fellow WTO members[2]. Now, lowering the tariff binding, from τ_B^0 to τ_B^1 does lower future tariff uncertainty as the support of the distribution of future applied MFN tariffs is now $\tau_{MFN} \in [0, \tau_B^1]$, but the importing country is still free to set τ_{MFN} unilaterally. In this paper, trade policy uncertainty is that the applied GSP tariff ($\tau_{GSP} = 0$) could revert to the applied MFN tariff ($\tau_{MFN} \leq \tau_B$). These two potential states, τ_{GSP} or τ_{MFN}, make the approach of Handley and Limão (2015) the more applicable.

Handley and Limão (2015) uses an $N + 1$ industry setup, where N industries produce differentiated goods with one homogeneous good industry that serves as a numeraire good. Labor is the only input and firms are heterogeneous in the differentiated sectors, with cost c_i. Of importance in Handley and Limão (2015) is that firms are sufficiently small as to not affect demand in the importing country. Given that this paper is looking at GSP eligible products, the second assumption is met; $\tau_{GSP} = 0$ is only set on products which Colombia has low or non-existent levels of market power.

Continuing with the outline of Handley and Limão (2015), they assume that there are two regimes. The current regime is analogous to my $\tau_{GSP} = 0$, whereas the alternative regime, which occurs with probability γ, would correspond to switching to τ_{MFN}. Handley and Limão (2015) assumes that γ is the same across industries, which based on the fact that the US and Canada vote extend the GSP program, not the tariffs on individual products, their assumption matches the analysis in this paper.

When firms are deciding to enter a market, they maximize discounted future expected profits and have to pay a fixed cost K. Firms also have the option of waiting to export, and although they do not receive the revenue from exporting, they do not have pay the cost K. The future profits of an exporting firm with cost c at a given time t would be:

$$\Pi(c, \tau) = \pi(c, \tau_{GSP,t}) + \beta[(1 - \gamma)\Pi(c, \tau_{GSP,t+1}) + \gamma\Pi(c, \tau_{MFN,t+1})].$$

The ability for a firm to wait before exporting, and paying the cost K, in Handley and Limão

[2]Beshkar and Bond (2017) discuss how the WTO agreement allows for countries to temporarily set tariffs above the binding, but this ability is outside the scope of this paper

(2015) drives the increase in number of exporting firms when there is no trade policy uncertainty ($\gamma = 0$). Under trade policy uncertainty ($\gamma > 0$) the cost cutoff (c^D) is lower than under a deterministic regime. Colombia entering into a PTA with the United States is the removal of trade policy uncertainty, as there is now only one tariff regime, $\tau_{PTA} = 0 = \tau_{GSP}$. It is this elimination of trade policy uncertainty that is driving the increase in the extensive margin found in this paper.

3 Data

The source of Colombian firm-level-export data comes from a proprietary source for trade statistics[3]. The firm-level data is collected from various government organizations within Colombia. Of importance for this paper, the data contains a firm identifier. The identifier allows for the extensive margin of trade to be defined as the probability a firm exports a product to a destination. The data covers the years 2007-2013. The total volume of exports does not exactly match the total world exports from the UN COMTRADE database, but it come closes to matching the total exports: for example in 2008 the total value of exports is off by 6.45% from the COMTRADE value and 6.41% in 2011. The original data classifies products at the 10-digit HS level. Product information is then aggregated up to the 6-digit HS level. The 6-digit code is the most disaggregated level that is internationally agreed upon; an 8- or 10-digit HS export codes, or sublines, for Colombia could represent a different product than the same 8- or 10-digit HS import code for the United States. As the export data is matched with tariff data from the importing countries, this ensures tariffs are more accurately matched with products[4]. One potential issue with the data is that the data does not list which revision of the HS codes are used. This lack of data is potentially problematic as the HS codes underwent a new revision in 2007 and in 2012. Therefore it is possible not all products were coded in HS2007 for 2007 and likewise for 2012. I will assume that all products are classified according to the most recent HS revision, ie all products from 2007-2011 are classified under HS2007 and all products from 2012-2013 are classified under HS2012.

As with firm-level data there is the worry that the data has been accidentally entered incorrectly. In particular one issue would be if the ExporterID was not unique due to entry error. To attempt to eliminate instances of entry error observations where a firm does not export a given product to any destination for more than two years are dropped. Likewise there could be entry error for the

[3] http://www.datamyne.com/

[4] Some countries have different tariffs for 8-digit HS products within the same 6-digit code; this will be addressed later

10-digit product codes. Thus any products that have less than 100k USD worth in exports over the entire sample are dropped.

During the time period for which I have export data Colombia entered into multiple trade agreements. For this paper five destinations will be analyzed: Canada, El Salvador, Guatemala, Honduras, and the United States. Some agreements, such as the agreement with the European Union go into effect in mid-2013 an thus do not offer time to analyze the post-agreement effects. Another agreement that is dropped is the agreement with Chile. Before Colombia and Chile entered into a PTA they were both members of the Latin American Integration Association (LAIA) and thus already offered tariff concessions to each other. Data on the LAIA tariffs are not readily available and thus the size of the tariff cut given to Colombian exports to Chile is not known.

Tariff data comes primarily[5] from the WTO's Tariff Analysis Online (TAO) database[6]. The TAO database specifies which HS revision is used for each tariff line. The tariffs provided are at the 8- or 10-digit level depending on the country. The database also details tariffs under various programs: Most Favored Nation (MFN) rates, Generalized System of Preferences (GSP) eligibility[7] and rates, along with PTA eligibility and rates. Only data on ad valorem are kept; this drops mixed tariffs and specific tariffs.

The main reason that I make an assumption on the trade data's HS revision is for concording trade and tariff data across the revisions. A concordance mapping from HS2007 to HS2012 is used[8]. From here the Pierce and Schott (2012) method of synthetic codes is used. This method controls for i) products that are split into multiple new codes and ii) products that are condensed into one new code. Thus controlling for these avoids any bias in what might appear to be a firm-product-destination entrant or exit. From here on product will refer to the synthetic code created during concording.

After concording the tariff data a simple average of tariff rates is created using the tariff rate for all listed sublines within the newly created synthetic 6-digit code. One issue with creating the simple average is that not all sublines are given GSP preferences. Therefore the measure of whether a product receives GSP treatment is the average of eligibility over the 6-digit code's sublines. Thus my measure of GSP eligibility does not only take values of 0 or 1. As is shown later the results

[5]The exception is Honduras, which does not have preferential tariff data available on the TAO, but has preferential tariff data available at http://rtais.wto.org/UI/PublicAllRTAList.aspx

[6]https://tao.wto.org/

[7]The United States excludes Colombia from GSP eligibility for some products

[8]Taken from https://unstats.un.org/unsd/trade/conversions/HS%20Correlation%20and%20Conversion%20tables.htm

are robust to what percentage of products are GSP eligible for the 6-digit code to be considered a GSP product. The final result is a simple average of the MFN tariff, GSP tariff, and Colombia's preferential tariff under the agreement by destination-product-year.

4 Estimation and Identification

The main estimation technique of the this paper will be a difference-in-difference approach. The policy will be the entry into force of a trade agreement. The policy will affect three groups: i) products that received a tariff cut ii) products that did not receive a tariff cut, but went from GSP preferences to PTA preferences and iii) experienced no change in tariff or programs that could be claimed[9]. Groups (i) and (ii) will serve as the treatment groups as they experience a change other than the decrease in non-tariff barriers that are often present in PTAs. Group (i) experiences a tariff cut, while group (ii) experiences a decrease in future uncertainty in tariffs. The uncertainty is decreased as GSP preferences have to be approved by Congress and at times are applied retroactively when GSP preferences have lapsed[10].

The main estimation equation for comparing effects within trade agreement will be

$$\begin{aligned} y_{ikft} = \alpha + \beta^1 GSP_{ik} + \beta^2 PRF_{ik} + \beta^3 (Post * GSPGap)_{ikt} + \beta^4 (Post * PRFGap)_{ikt} \\ + \beta^5 Post_{it} + \delta_t^1 + \delta_f^2 + \delta_{HS2,i}^3 + X_{ik} + \epsilon_{ikft} \end{aligned} \tag{1}$$

where i is the destination PTA partner country, k is the product, f is the firm, and t is the year. y_{ikft} can be the following: i) a dummy that takes the value 1 if a firm exports a product to a destination country in a year, ii) the (log) value of exports a firm has for a product-destination each year, iii) the (log) of unit values per firm-product-destination for each year. GSP_{ik} and PRF_{ik} are dummies that take the value of 1, if the product is GSP eligible the year before the agreement enters into force, and if the product is eligible for a preferential rate due to the PTA, but not classified as GSP eligible, respectively. $GSPGap_{ikt}$ is defined as $GSP_{ik} * ln[\frac{1+MFN_{ikt}}{1+GSPRate_{ikt}}]$. $Post_{it}$ is a dummy that equals 1 if a trade agreement is in force between Colombia and country i at time t. $GSPRate_{ikt}$ is the simple average of the GSP tariff while MFN_{ikt} is the simple average of the MFN tariff. $PRFGap_{ikt}$ is defined as $PRF_{ik} * ln[\frac{1+MFN_{ikt}}{1+PRFRate_{ikt}}]$, where $PRFRate_{ikt}$ is the preferential

[9]There is evidence from Pomfret et al. (2010)that preferential programs are not always claimed, yet Keck and Lendle (2012) find preferential rates, especially for US and Canadian imports are widely claimed. I am assuming that all eligible products are claimed

[10]https://www.cbp.gov/trade/trade-community/outreach-programs/trade-agreements/special-trade-programs/gsp/gsp-renewal

rate after trade agreement is in force. If reductions in uncertainty increase y_{ifkt} then β^3 is expected to be positive, while if tariff cuts increase y_{ifkt} then β^4 is expected to be positive. One issue with $Post_{it}$ that bears mentioning is that trade agreements in the sample do not go into force on January 1st of a given year. Thus $Post_{it}$ only takes the value of 1 when the trade agreement has been in force for a full year. δ^1 is a year fixed effect where the first year, 2007, is excluded. δ^1 is constructed in this manner as the policy, entry of the PTA into force, differs based on the destination country. δ^2 is an exporter fixed effect. δ^3 is a Country-HS2 fixed effect. δ^3 allows to look 'within' as defined in Buono and Lalanne (2012). X_{ik} are country-year controls, specifically: i) GDP, ii) per capita GDP, and iii) exchange rate.

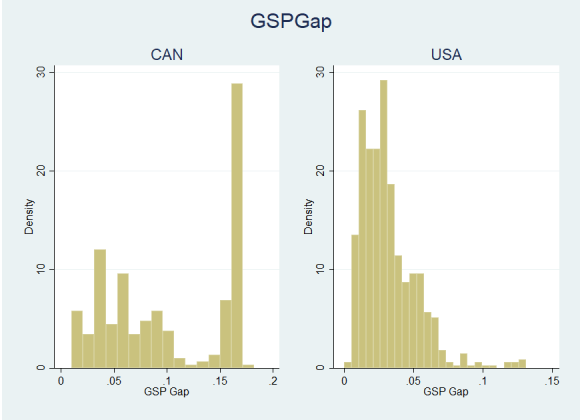
When y_{ikft} is a dummy representing whether a firm exported a product to that destination in time t, the diff-in-diff approach is calculating the linear probability of exporting. A linear probability model is used instead of a probit model to avoid the incidental parameter problem.

To investigate the effect of tariff reductions compared to products without any GSP related changed, products with GSP eligibility will be dropped, resulting in GSP_{ik} and $GSPGap_{ikt}$ being dropped from the estimation equation. Similarly when comparing products with changes in GSP certainty to products without any tariff reductions PRF_{ik} and $PRFGap_{ikt}$ are dropped.

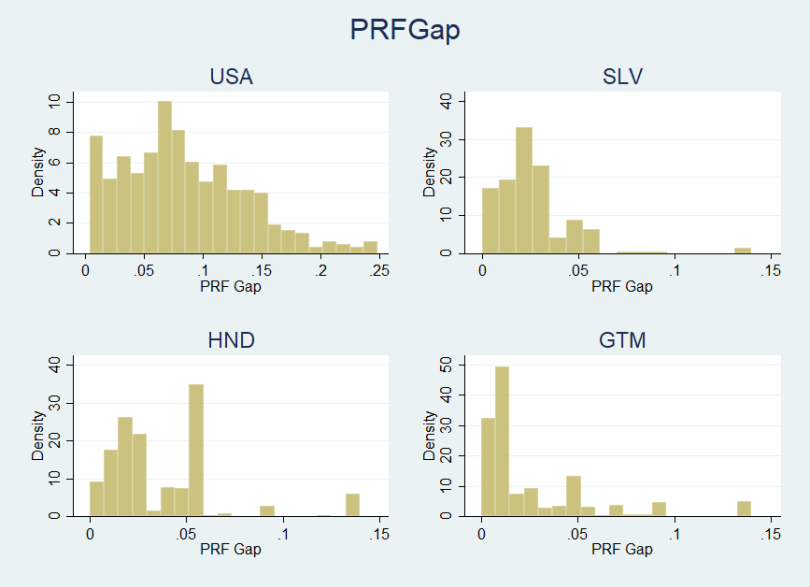
To properly identify the above estimation equation, three conditions must be satisfied: i) variation in the GSPGap and the PRFGap, ii) exogeneity of the shock for the PRFGap and the GSPGap, and iii) parallel trends before the shock.

4.1 Variation in Gaps

To be able to properly identify β^3 and β^4, there needs to be variation in both $GSPGap$ and $PRFGap$. The distribution of $GSPGap$ and $PRFGap$ can be seen for both GSP destinations, and four of the five tariff cut destinations.



The variation in the GSPGap for both Canada and the United States, shows that Canada has a larger variation in the GSPGap. Compared to the US, Canada has many products with gaps larger than 10 percentage points, whereas the US has most of its GSPGaps below 5 percentage points. Although the US distribution is skewed, there are values for most every level. One issue with tariffs, is that countries may set uniform tariffs, to decrease the transactions costs associated with WTO negotiations.



For the PRFGap, most of the tariff cuts are less than five percentage points. One potential issue is that most tariff cuts are concentrated in products where the initial tariff was 5% or below. As Estevadeordal et al. (2008) found, a preference margin (MFN Tariff - PTA Tariff) of 2.5 is needed to induce exporting. However, as previous work has found (Buono and Lalanne, 2012) tariff cuts have little influence on the extensive margin.

4.2 Exogeneity of Tariff Shocks

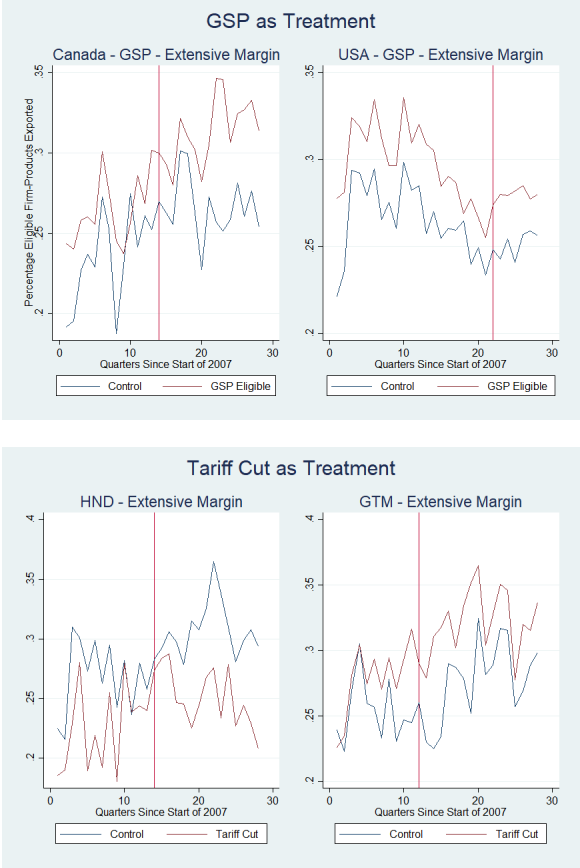
Assuming that GSP eligible products and products that did not receive a tariff cut are similar in how they would be affected by a reduction in the previously mentioned non-tariff barriers implies that a larger reduction in uncertainty about future tariffs increases the probability of a firm exporting a product. GSP eligible products are given preferential treatment due to their small trade volumes and thus the gap between GSP preferences and MFN tariffs can be viewed as exogenous due to the fact the importing country is not considering Colombia when setting the MFN tariff for those products. Also, both Canada and the United States are able to remove GSP status for certain products from Colombia. For example, the United States does not grant Colombia GSP status for various flowers; a product Colombia is a large exporter of. For the United States and Canada, roughly 96% of lines classified as non-GSP and non-tariff cut in 2011 already had an MFN rate of 0%. Therefore the worry that products not receiving a cut were selected due to endogenous protectionist reasons is unfounded.

Therefore the comparison of GSP eligible products (the treatment group), to products without a tariff cut, that were not GSP eligible (the control group), the GSP products are hit with an exogenous reduction in future tariff uncertainty.

In regards to comparing products with a tariff cut (treatment group) to goods that did not have a change in the tariff or were not GSP eligible (control group), the reduction in tariffs is governed by WTO rules (GATT Article XXIV) regarding PTAs; tariffs must 'eliminated on substantially all the trade.' This requirement means that essentially all products must have the tariff reduced to zero (over time).

4.3 Evidence of Parallel Trends

The last requirement for identification, is the assumption of parallel trends for both the treatment and control groups before the trade agreement enters into force. Not all combinations are shown below, but rather representative ones for the extensive margin are selected to show the existence of the parallel trend.



Both of the above graphs provide evidence of the parallel trends, for the extensive margin. With the variation, exogeneity, and existence of parallel trends, the coefficients can be identified.

5 Results

As previously mentioned, when aggregating up from sublines to the 6-digit HS code, it is possible that some, but not all, sublines are GSP eligible. Thus an indicator for GSP status need not equal 1. To capture instances where not all sublines are GSP eligible three cuts are used to be included in the GSP treatment group: i) all sublines are eligible, ii) 75% or more of the sublines are eligible, and iii) 50% or more of the sublines are eligible.

In the below estimations careful attention is paid to ensure that year dummies, which are needed to compare post-PTA effects to pre-PTA effects, are not dropped. Likewise the year dummy for 2007, which is pre-PTA for all agreements, is never included. Due to the large number of firms the STATA command (reghdfe) from Guimarães and Portugal (2010) is used in the estimation[11].

[11] ExporterID is 'absorbed' while all other FEs are specified in the regression to ensure needed FEs are not dropped unknowingly

5.1 Extensive Margin

The extensive margin is defined as the probability that a firm exports a product to a destination.

In Table 1 the results of looking within PTAs and only comparing products that were GSP eligible to products to products that were not GSP eligible and did not receive a tariff cut are show.

Table 2 compares products with a tariff cut to products without a tariff cut and that were not GSP eligible. Here a larger reduction in tariffs does not increase the probability that a firm exports a product. However as mentioned in the benefits of the GSP estimations, the MFN rate is set endogenously to GSP eligible products. As Colombia is a small exporter, MFN tariffs could be set higher for products that the destination country imports large volumes of, or a large share from a specific country. Colombia need not export these products; thus a what appears to be a large reduction in the applied tariff is not an important cut for Colombia. To account for this issue Table 2 also contains $TPRF$, which is a dummy that is the interaction of the PRF treatment group and a dummy indicating the PTA is in force. Looking at the coefficients on TPRF there is an indication that products receiving a tariff cut saw a small increase in the probability of exporting. Also the corresponding interaction term is not reported for TGSP in Table 1 the values on TGSP are two to three times larger and significant at the one percent level. Of importance is the inclusion of Country-HS2 (or Country-Sector) fixed effects. Unlike Buono and Lalanne (2012) , which finds that once Country-HS2 fixed effects are included (or within regression using their nomenclature) tariff reductions are no longer a significant for the extensive margin, this paper finds that even when including Country-HS2 fixed effects the extensive margin matters. The potential sources of difference are that Buono and Lalanne (2012) defines the extensive margin as the number of firms, runs a gravity estimation, and analyzed the Uruguay Round of WTO tariff cuts. Whereas this paper defines the extensive margin as the probability of exporting, uses a diff-in-diff estimation, and looks at preferential tariff cuts and reductions in tariff uncertainty. It could be that preferential tariff cuts give firms that would not otherwise export a competitive advantage and the advantage is enough for them to overcome the fixed costs of exporting.

Taking the results presented in Tables 1 and 2 together it appears that tariff cuts have only a small affect on the probability of a firm exporting a product to a destination in the short run after a PTA enters into force. Whereas as reduction in uncertainty in future tariffs has a much larger impact on the extensive margin in the short run after a PTA enters into force. The coefficient

Table 1: Extensive Margin - GSP Eligible Products

	50%		75%		100%	
GSP	0.00512	0.0158	0.0101	0.0165	0.0130	0.0172
	(0.0167)	(0.0190)	(0.0227)	(0.0265)	(0.0249)	(0.0294)
GSPGap	0.499***	0.514***	0.509***	0.517***	0.547***	0.555***
	(0.160)	(0.160)	(0.173)	(0.171)	(0.175)	(0.172)
Observations	66,396	66,396	54,119	54,119	50,929	50,929
HS2 FE	Yes		Yes		Yes	
Country FE	Yes		Yes		Yes	
Country-HS2 FE		Yes		Yes		Yes
R-squared	0.172	0.173	0.181	0.183	0.184	0.186

[1] Clustered standard errors by product in parentheses

[2] *** p<0.01, ** p<0.05, * p<0.1

[3] Year and Exporter FEs included in each estimation

Table 2: Extensive Margin - Tariff Cut

	50%			75%			100%		
PRF	0.00577	-0.00170	-0.00912	0.00449	0.00295	-0.00373	0.00298	0.00268	-0.00424
	(0.00555)	(0.00760)	(0.00829)	(0.00540)	(0.00738)	(0.00799)	(0.00533)	(0.00715)	(0.00774)
PRFGap	-0.0415	-0.0161		-0.0347	-0.0223		-0.0448	-0.0359	
	(0.0801)	(0.0810)		(0.0795)	(0.0794)		(0.0794)	(0.0792)	
TPRF			0.0188**			0.0183**			0.0190**
			(0.00840)			(0.00778)			(0.00765)
Observations	121,772	121,772	121,772	134,106	134,106	134,106	137,298	137,298	137,298
HS2 FE	Yes			Yes			Yes		
Country FE	Yes			Yes			Yes		
Country-HS2 FE		Yes	Yes		Yes	Yes		Yes	Yes
R-squared	0.144	0.150	0.150	0.142	0.148	0.148	0.140	0.146	0.146

[1] Clustered standard errors by product in parentheses

[2] *** p<0.01, ** p<0.05, * p<0.1

[3] Year and Exporter FEs included in each estimation

on *GSPGap* in the final column of Table 1 implies there is a 3 percentage point increase in the likelihood of a firm exporting a GSP-eligible product to a destination, if the product has the average GSPGap.

5.2 Intensive Margin

The intensive margin is defined as the value of shipments, in FOB and USD, per firm-product to a destination. Unlike the extensive margin tables, the intensive margin only includes positive trade flows, which explains the fewer observations.

Unlike the results for the extensive margin, both a large reduction in tariffs and a larger reduction in tariff uncertainty increase the value of firm-product exports. In Tables 3 and 4 that a reduction in trade costs increases trade volume. Of note is that the coefficients in Table 3 are larger than those in Table 4. The implication is that a reduction in uncertainty not only plays a larger role in the extensive margin, but also the intensive margin. One potential explanation for the larger coefficient for the GSP group is that these firms were already exporting due to the preferential tariff. When the uncertainty surrounding future tariffs went away due to the PTA importing firms were able to place larger future orders knowing the tariff would still be zero in the years ahead. The results in last column of Tables 3 and 4 imply that a product with an average reduction in GSP rate uncertainty would see a 9% increase in volume, and a product with an average reduction in applied tariffs would see a 14% increase in volume.

5.3 Robustness Checks

The following robustness checks are run: i) looking at trade margins for exporters that were already exporting any product to the destination country, ii) analyzing quarterly trade data instead of yearly, and iii) defining the extensive margin as the number of firms.

5.3.1 Previous Exporters

For this section a previous exporter is defined as firm that has exported any product the destination country before the PTA enters into force. Looking at these preexisting exporters will help show if the extensive margin is increasing only due to entirely new firms exporting, or multiproduct firms exporting a second product. The results presented in Table 5 suggest that the growth in the

Table 3: Intensive Margin - GSP Eligible Products

	50%		75%		100%	
GSP	0.197	0.336	0.535	0.629	0.678	0.792
	(0.462)	(0.530)	(0.590)	(0.651)	(0.642)	(0.697)
GSPGap	3.067***	3.346***	3.041***	3.385***	2.827***	3.209***
	(0.940)	(1.077)	(0.809)	(0.989)	(0.828)	(0.992)
Observations	30,879	30,879	25,021	25,021	23,584	23,584
HS2 FE	Yes		Yes		Yes	
Country FE	Yes		Yes		Yes	
Country-HS2 FE		Yes		Yes		Yes
R-squared	0.570	0.577	0.601	0.606	0.606	0.611

[1] Clustered standard errors by product in parentheses
[2] *** p<0.01, ** p<0.05, * p<0.1
[3] Year and Exporter FEs included in each estimation

Table 4: Intensive Margin - Tariff Cut

	50%		75%		100%	
PRF	-0.0136	-0.0750	-0.0750	-0.124	-0.102	-0.141
	(0.133)	(0.194)	(0.121)	(0.183)	(0.119)	(0.177)
PRFGap	1.699***	2.059***	1.754***	1.978***	1.859***	2.058***
	(0.614)	(0.551)	(0.590)	(0.541)	(0.584)	(0.539)
Observations	58,211	58,211	64,080	64,080	65,530	65,530
HS2 FE	Yes		Yes		Yes	
Country FE	Yes		Yes		Yes	
Country-HS2 FE		Yes		Yes		Yes
R-squared	0.534	0.547	0.525	0.538	0.523	0.535

[1] Clustered standard errors by product in parentheses
[2] *** p<0.01, ** p<0.05, * p<0.1
[3] Year and Exporter FEs included in each estimation

extensive margin seen previously is being driven by new exporters. From a distributional aspect this result implies that trade agreements do not solely benefit the preexisting (and most productive) exporting firms.

Table 5: Extensive Margin - Previous Exporters

	50%		75%		100%	
GSP	0.0182		0.0202		0.0212	
	(0.0199)		(0.0277)		(0.0306)	
GSPGap	0.153		0.143		0.187	
	(0.156)		(0.169)		(0.170)	
PRF		-0.00123		0.00410		0.00395
		(0.00830)		(0.00795)		(0.00766)
PRFGap		-0.0289		-0.0396		-0.0580
		(0.0794)		(0.0772)		(0.0772)
Observations	63,784	111,898	51,920	123,819	48,842	126,899
R-squared	0.169	0.151	0.179	0.149	0.182	0.147

[1] Clustered standard errors by product in parentheses
[2] *** p<0.01, ** p<0.05, * p<0.1
[3] Year, Exporter, and Country-HS2 FEs included in each estimation

5.3.2 Quarterly Data

One issue with using yearly data is that the analyzed trade agreements do not enter into force on January 1st. For an agreement that enters into force in August two sources of bias arise i) it is possible firms withhold shipments leading up to the entry into force, so as to export a few weeks or months later at the lower tariff and ii) if entry and increased volumes occurs shortly after the agreement goes into effect these changes are currently counted towards the pre-agreement numbers. Looking at quarterly data, which can be done as the initial export data contains the date the shipment was declared.

However trade data is noisy; firms do not export every month, or even every quarter. To compensate for noisy trade data a three-quarter moving average is created. The moving average is the sum of the current quarter, the previous quarter and the following quarter. The moving average with quarterly trade data attempts to balance the noise and the desire to more accurately compare trends near the date the agreement goes into force.

Table 6: Extensive Margin - Quarterly

	50%		75%		100%	
GSP	0.0166		0.0245		0.0256	
	(0.0237)		(0.0315)		(0.0352)	
GSPGap	0.373***		0.390***		0.392***	
	(0.0944)		(0.0965)		(0.0968)	
PRF		-0.00339		-0.00279		-0.00223
		(0.00821)		(0.00818)		(0.00795)
PRFGap		0.0349		0.0288		0.0286
		(0.0572)		(0.0560)		(0.0559)
Observations	265,584	487,088	216,476	536,424	203,716	549,192
R-squared	0.189	0.147	0.199	0.147	0.203	0.145

[1] Clustered standard errors by product in parentheses
[2] *** p<0.01, ** p<0.05, * p<0.1
[3] Year, Exporter, and Country-HS2 FEs included in each estimation

The results in Table 6 are similar to those in Tables 1 and 2: larger tariff cuts are not that significant for the extensive margin while larger decreases in uncertainty are associated with increases in the extensive margin. The coefficient on $GSPGap$ is smaller than those in Table 1. A possible explanation is that thee quarterly data is averaged over three quarters. Thus if a firm exports a product only in December each year after the PTA enters into force, the yearly data always records the firm as exporting, whereas the quarterly data views this example as a stop in exporting for the second quarter of a year.

Table 7: Intensive Margin - Quarterly

	50%		75%		100%	
GSP	0.371		0.679		0.840	
	(0.526)		(0.642)		(0.687)	
GSPGap	2.986***		2.963***		2.797***	
	(1.101)		(0.900)		(0.878)	
PRF		-0.0531		-0.103		-0.119
		(0.199)		(0.187)		(0.181)
PRFGap		2.573***		2.486***		2.564***
		(0.543)		(0.534)		(0.536)
Observations	105,586	197,692	85,736	217,584	80,944	222,381
R-squared	0.577	0.550	0.606	0.540	0.611	0.538

[1] Clustered standard errors by product in parentheses
[2] *** p<0.01, ** p<0.05, * p<0.1
[3] Year, Exporter, and Country-HS2 FEs included in each estimation

The results in Table 7 are similar to the results presented in Tables 3 and 4. Like with the extensive margin the coefficients on *GSPGap* are smaller than for the yearly data. The same explanation could hold. However the coefficients on *PRFGap* are larger than the yearly results. The large coefficients are most likely a result of the increased trade shortly after the agreement goes into force are now attributed to the trade agreement, whereas in the yearly results the increase in trade volume at times was counted as pre-agreement trade.

5.3.3 Number of Firms

At times in the literature the extensive margin is defined as the number of firms exporting a product to a destination. Likewise although the probability of a firm exporting a product may increase, the increase on the number of total firms exporting a product could be negligible.

Table 8: Number of Firms - Yearly

	50%		75%		100%	
GSP	0.236		0.273		0.293	
	(0.161)		(0.227)		(0.253)	
GSPGap	1.221**		1.261**		1.354**	
	(0.537)		(0.562)		(0.562)	
PRF		0.137***		0.139***		0.134***
		(0.0381)		(0.0358)		(0.0347)
PRFGap		-0.195		-0.255		-0.280
		(0.311)		(0.299)		(0.299)
Observations	66,396	121,772	54,119	134,106	50,929	137,298
R-squared	0.351	0.290	0.363	0.291	0.370	0.287

[1] Clustered standard errors by product in parentheses
[2] *** p<0.01, ** p<0.05, * p<0.1
[3] Year, Exporter, and Country-HS2 FEs included in each estimation

For Table 8 the dependent variable is ln(1+Number of Firms). In line with the previous extensive margin results, *GSPGap* is positive and significant, although the coefficients are now only significant at the 5% level. These results suggest that the increase in the probability a firm exports has more than a non-negligible affect on the number of firms exporting a product. Also once again a reduction in tariffs does not affect the extensive margin.

6 Conclusion

This paper uses a Colombian firm-level export dataset to investigate how Colombian firms reacted to Colombia entering into PTAs from 2007-2013. Using a diff-in-diff estimation strategy this paper identifies two potential sources of trade expansion after an agreement is entered into force: i) a reduction in the (now preferential) applied tariff in relation to the applied MFN tariff, and ii) a reduction in uncertainty over future tariffs for products that received one-way preferential rates that no longer need to be renewed due to the PTA. Defining the extensive margin as the probability a firm exports a product to a destination in a time period, the larger the reduction in uncertainty (as measured by the gap between the one-way preferential rate and the MFN rate) the larger the increase in the probability of exporting in the short run. However larger reductions in the applied tariff have little effect on the extensive margin. Defining the intensive margin as the value of exports by firm-product-destination, both larger tariff cuts and reductions in uncertainty over future tariffs increase the intensive margin in the short run. Yet the reduction in uncertainty has a larger affect on the intensive margin than a reduction in applied tariffs. This paper stresses the important role that reducing uncertainty plays in trade agreements. The main drawback of analyzing only 2007-2013 is that these results are only for the short run. It is documented that trade agreements increase trade even five years after entry into force. Given the literature on turnover in exporting firms, these increases could be short lived.

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