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Effects of Lowering Tariffs on Extensive and Intensive Margins in Latin America, 1990–2015

Federico Merchán[a] and Mauricio Mesquita Moreira[b]

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Abstract

To study how trade liberalization has impacted Latin America's extensive and intensive margins between 1990 and 2015, we estimated the random growth first-difference model proposed by Baier, Bersgtrand, and Feng (2014), replacing their economic integration agreement dummy with a tariff-change variable. We found that in the short run (over five years), lowering bilateral country tariffs increases the value of trade and the intensive margin, but not the extensive margin. For the long-term analysis (over 25 years), we estimated an extended version of Debaere and Mostashari's (2010) methodology, finding that the range of products that Latin American countries[1] exported increased only 4.61% due to tariff reductions between 1990–2015.

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Key words: Trade liberalization, Latin America, extensive margin, intensive margin.

[1] The Latin America (LA) countries are: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, Uruguay, and Venezuela. The estimations include these countries as exporters.

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1. DATA

Bilateral trade: COMTRADE provides data on annual bilateral trade from 1990 to 2015 that is disaggregated at the product level (HS88 6-digit level).

Tariffs: The dataset is a joint CESIfo Group-World Bank effort following Felbermayr, Teti, and Yalcin's (2018) methodology. This dataset includes the effectively applied tariff imposed by an importer for every good at the HS88 6-digit level from any destination country for 1988–2015. The effectively applied tariff equals the MFN tariff except in bilateral relations where a preferential arrangement (such as a CU, an FTA, or a GSP regime) is in place.[2] We calculated the unweighted average of the applied tariff[3] for each importer-exporter pair to include in the random growth first-difference model.

2. METHODOLOGY

Baier, Bersgtrand, and Feng (2014) estimated a random growth first-difference model to test the effect of economic integration agreements on trade value, extensive margin (EM), and intensive margin (IM). For this purpose, they followed Hummels and Klenow's (2005) decomposition method to obtain the EM and IM measure for each country pair.

Basically, Hummels and Klenow (2005) defined the extensive margin (EM) as "the fraction of all products that are exported from *i* to *j* in year *t*"[4] (Baier, Bersgtrand, and Feng, 2014: 343). The intensive margin (IM) is defined as "the share of country *i* in country *j*'s imports from the world within the set of products that *i* exports to *j* in year *t*"[5] (Baier, Bersgtrand, and Feng, 2014: 343).

Our estimation replaces the economic integration agreement dummy in Baier, Bersgtrand, and Feng (2014) with another dummy that indicates if the bilateral tariff reduction was larger than the median decrease made by each importer. This dummy tries to identify the "liberalizer" country pairs. The time horizon we used for the calculation was five years, as in Baier, Bersgtrand, and Feng (2014).[6] Our estimated model was:

$$\Delta_5 In\, X_{ijt} = \beta_0 + \beta_1 \left(d\_\Delta_5(tf)_{ijt} \right) + \alpha_{5,it} + \gamma_{5,jt} + \vartheta_{ji} + \epsilon_{ijt} \qquad (1)$$

where $In\, X_{ijt}$ is total bilateral trade, extensive margin, and intensive margin. $d\_\Delta_5(tf)_{ijt}$ is a dummy that takes the value of 1 if the bilateral tariff reduction between *i* (exporter) and *j* (importer) in *t* was larger than the median reduction made by *j (*importer) in *t*. $\alpha_{5,it}$ are importer-year fixed effects, $\gamma_{5,jt}$ are exporter-year fixed effects, and ϑ_{ji} are country-pair fixed effects. The importer-year and exporter-year fixed effects capture time-varying country specific observables (like GDP or population) and unobservable characteristics that impact

[2] The data is totally reliable after 1995 (WITS implementation). The 1990 data may overestimate tariffs for some countries because of the imputation method applied.

[3] "*The use of an unweighted tariff is important to avoid the criticism that is often leveled in the literature at import-weighted tariffs, namely that they may understate protection when some tariff rates are at or near prohibitive levels.*" Estevadeordal and Taylor (2013: 11).

[4] "$EM_{ijt} = \frac{\sum_{m \in M_{ijt}} X^m_{Wjt}}{\sum_{m \in M_{Wjt}} X^m_{Wjt}}$ where X^m_{Wjt} is the value of country *j*'s imports from the world in product *m* in year *t*, M_{Wjt} is the set of all products exported by the world to *j* in year *t*, and M_{ijt} is the subset of all products exported from *i* to *j* in year *t*."' Baier, Bersgtrand, and Feng (2014: 343).

[5] "$IM_{ijt} = \frac{\sum_{m \in M_{ijt}} X^m_{ijt}}{\sum_{m \in M_{ijt}} X^m_{Wjt}}$ where X^m_{ijt} is the value of exports from *i* to *j* in product *m* in year *t*. X^m_{Wjt} is the value of country j's imports from the world in product m in year t." Baier, Bersgtrand, and Feng (2014: 343)

[6] Most of the results are robust to time horizon changes.

trade. The bilateral fixed effects account for non-time-varying characteristics in the bilateral relationship, like distance and common language. The sample was restricted to Latin American exporter countries.

We then we estimated an extension of the probit suggested by Debaere and Mostashari (2010) to identify the impact of changing tariffs on the range of goods that countries export to the United States. We added bilateral fixed effects because our sample has multiple importers. We also estimated a linear probability model due to the high number of fixed effects. Again, the sample was restricted to exporters from Latin American countries. Our estimated model was:

$$y_{ijz} = \beta_0 + \beta_1 \Delta_{25}(\ln(1+tf)_{ijz} + \beta_2 status90_{ijz} + \vartheta_{ji} + \gamma_z + \epsilon_{ijz}$$

where the dependent variable y_{ijz} is a dummy that indicates if country *i* exports good *z* to country *j* in 2015. $\Delta_{25}(\ln(1+tf)_{ijz}$ is the change in the natural log of the effectively ad valorem equivalent tariff imposed by country *j* on country *i* for good *z*. $status90_{ijz}$ is a dummy that indicates if good *z* was exported by country *i* to country *j* in 1990. ϑ_{ji} are country-pair fixed effects and γ_z are product fixed effects.

Finally, "the tariff change contribution is calculated as the expected number of new goods exported due to tariff changes as a share of the expected number of new goods exported"[7] Debaere and Mostashari (2010: 169).

3. RESULTS AND CONCLUSIONS

Table 1 shows the estimation of equation 1 where the dependent variables are trade value, intensive margin (IM), and extensive margin (EM). The lags of the tariff dummy $d\_\Delta_5(tf)_{ijt}$ are included in some specifications. As can be seen, the bilateral tariff decrease has positive short-term impacts on trade value and the intensive margin but no impact on the extensive margin. So, the drop in the bilateral country tariff incentivizes exports of traditionally traded products (the intensive margin) but not exports of new goods (the extensive margin). Consequently, the total bilateral trade increases via the intensive margin.

Nevertheless, the negative coefficients for the lag in the intensive margin suggest that the intensive margin effect tends to disappear in the long run. In contrast, the extensive margin effect tends to emerge in the long run, given that the lag coefficients are positive. This would indicate that Latin American firms require more than five years to export new goods to a country that has decreased its tariffs. However, these results should be interpreted with caution because the lag coefficients are not statistically significant.

On the other hand, the linear probability model indicates that the tariff decrease has a positive impact on the probability of exporting a good. Specifically, the coefficient indicates that a 1-percentage-point drop in the tariff rate increases the probability of exporting a particular good by 0.00224 percentage points. The tariff change contribution calculation indicates that 4.61% of the increasing extensive margin for 1990–2015 is explained by tariff reduction.

[7] $\frac{\sum_i \sum_{z \in Z}((\varphi(X_{iz}\hat{\beta}) - (\varphi(X_{iz}\hat{\beta} \,/\, lntariff=0))}{\sum_i \sum_{z \in Z}((\varphi(X_{iz}\hat{\beta})}$ *where Z comprises all goods not exported in* 1990.

TABLE 1. EFFECT OF TARIFF DECREASE ON TRADE VALUE, EXTENSIVE MARGIN (EM), AND INTENSIVE MARGIN (IM). LATIN AMERICA (2015–1990)

MODEL	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent variable	**Δ5 ln (trade)**	**Δ5 ln (trade)**	**Δ5 ln (trade)**	**Δ5 ln (IM)**	**Δ5 ln (IM)**	**Δ5 ln (IM)**	**Δ5 ln (EM)**	**Δ5 ln (EM)**	**Δ5 ln (EM)**
D_med_Δ5_tf	0.109	0.187**	0.288**	0.16**	0.22***	0.196*	-0.0548	-0.035	0.0921
	(0.08)	(0.09)	(0.12)	(0.08)	(0.09)	(0.12)	(0.06)	(0.06)	(0.08)
L5. D_med_Δ5_tf		-0.0955	-0.127		-0.111	-0.172		0.0151	0.0446
		(0.08)	(0.11)		(0.09)	(0.12)		(0.06)	(0.08)
L10. D_med_Δ5_tf			-0.006			-0.118			0.112
			(0.11)			(0.12)			(0.08)
Observations	7,356	4,994	2,745	7,356	4,994	2,745	7,356	4,994	2,745
R-squared	0.355	0.361	0.435	0.356	0.317	0.379	0.34	0.359	0.416
Imp_year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exp_year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses clustered at pair country. Note 1: The dummy was calculated based on the tariff median change by importer-year. *** p<0.01, ** p<0.05, * p<0.1

*** p<0.01, ** p<0.05, * p<0.1

TABLE 2. LINEAR PROBABILITY MODEL (LPM) ESTIMATES FOR THE EFFECT OF Δ LN (1+TF) ON EXPORT STATUS

	(1)	(2)	(3)	(4)
Variables	**D (positive exports 2015)**	**D (positive exports 2015)**	**D (positive exports 2015)**	**D (positive exports 2015)**
Δ LN (1+TF)	-0.00953***	-0.00907***	-0.00360***	-0.00224***
	(0.000914)	(0.000848)	(0.000287)	(0.000254)
D (positive exports 1990)		0.497***	0.346***	0.317***
		(0.0218)	(0.00851)	(0.00844)
Constant	0.0197***	0.0187***	0.0218***	0.0225***
	(0.000863)	(0.000817)	(0.000145)	(0.000128)
Observations	9,683,399	9,683,399	9,683,399	9,683,399
R-squared	0.005	0.030	0.185	0.222
Country pair FE	NO	NO	YES	YES
Product FE	NO	NO	NO	YES

Robust standard errors in parentheses clustered at pair country level. Linear probability model (LPM)

*** p<0.01, ** p<0.05, * p<0.1

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