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Any errors and interpretations are mine.

Abstract

In the presence of sunk costs to exporting, preferential tariff liberalization may have a prolonged, dynamic effect on the pattern of a beneficiary country's exports. In particular, preferential tariff liberalization might trigger a geographic spread of exports to third markets outside the preferential trading area. I test this hypothesis for the pattern of Mexican exports after the inception of NAFTA to several Latin American trading partners. After controlling for product specific shocks and the overall trend in export growth, the evidence is consistent with the hypothesis that initial exports to the United States further prompted exports to third markets. The results suggest a significant impact on exports to large or geographically proximate countries (Argentina, Brazil, Peru, Costa Rica, Guatemala, Honduras and Panama). The stunning growth in the extensive margin as a count measure owes much to rather simple goods, while more sophisticated goods exert a substantial impact on the value of Mexican exports. The findings also document the existence of considerable tariff-induced trade diversion for goods with little skill or technology content.

Keywords

Preferential tariffs, Mexico, NAFTA, sunk costs, conditional logit panel estimation

JEL Classification

F13, F15, K33

1 Introduction

This paper considers the impact of preferential market access on export product variety. The key idea is that firms might be prompted to extend their exports in a geographical manner when tapping overseas markets initially involves some sort of fixed cost. Hence, any positive shock that helps overcome export barriers—for instance a preferential tariff cut—may trigger a dynamic response. The persistence of export behavior that results from sunk costs is empirically well documented; however, what is less recognized are the implications of sunk costs for the dynamics of trade. One obvious question is whether exports that have initially been benefited from preferential market access do provide for a “bridgehead effect” (EVENETT and VENABLES, 2002) because they are instrumental in overcoming certain fixed costs to trade. This channel could explain why preferential market access translates into a geographic spread of trade that extends well beyond the initial preferential trading partner.

The intuition for the potential path dependency of exports is simple. Suppose there are product specific fixed costs like, e.g. marketing outlay. Once a given product is being shipped overseas—for instance attracted by preferential tariff cuts—it becomes easier to export that same product as well to additional destinations. That is, if average costs of exporting could be lowered by trading with multiple destinations, then preferences could make for a “path dependency of exporting”, in that serving a particular market initially (the preference-granting country) increases the ability, or probability, of also tapping additional export markets with the same product. The underlying assumption is that the granting of a preference margin is decisive in recouping the fixed costs of overseas market entry, in which case preferences could directly cause the spectrum of traded varieties to expand. Hence, a testable hypothesis is that for a given developing country, the existence of preferential market access should increase the probability of shipping preferred products to additional export markets.

This research addresses a number of both theoretical and policy-related issues. First,

with regard to the geographic dimension of diversification, very little is known on “third party effects” of trade liberalization. Preferential trading arrangements in particular have been criticized for their potentially adverse effects on ‘outside’ countries. Against this background it would be an interesting result to find that preferential market access facilitates the geographic spread of trade. Evidence to this effect would, secondly, also open up a new perspective on the evaluation of preferential market access schemes like, for instance, the Generalized System of Preferences (GSP). Those schemes had initially been established to facilitate developing countries’ transition towards a more diversified manufacturing export structure. Helping overcome fixed costs to exporting is one possible channel to live up to that goal. Thirdly, fixed costs are widely believed to be important in explaining the many zero trade flows, thus it is desirable—as a matter of theory—to further characterize the nature of these fixed costs based on empirical evidence. Lastly, to the extent that increasing product variety and export diversification gradually replace zero trade entries, research on the determinants of export diversification also contributes to the general literature on trade growth.

The idea of path dependency due to sunk costs is tested using Mexico’s exports under the North-American Free Trade Agreement (NAFTA). Existing empirical evidence on post-NAFTA trade patterns appears consistent with the conjectured mechanism. HILLBERRY and MCDANIEL (2002) assess the U.S.–Mexico preferential trade relations and document a rapid increase in Mexico’s exports to the U.S. both at the extensive margin (some 24 percent over 8 years) as well as at the quality margin (prices rose about 47 percent over the same period). HUMMELS (2006) goes a step further and contrasts Mexico’s within-NAFTA trade performance with that toward outside countries. His decomposition shows that the time period immediately following NAFTA’s inception coincides with a marked increase in the geographic spread of Mexican exports. While the number of HS-6 products exported to the U.S. rose from about 3,800 to 4,000 in 1994–97, the average number of destinations per HS-6 category for Mexican exports *other than the U.S.* increased from 14.9 to 20.7 over the same period. Even more strik-

ingly, the number of products shipped exclusively to the U.S. was almost cut in half (down from 457 in 1994 to 295 in 1997) while the number of goods shipped only to non-U.S. destinations stayed roughly constant (592 and 556, respectively). Ostensibly, products that were solely traded with the U.S. were subsequently taken on to new markets outside the U.S. A complementary result is contained in HUMMELS and KLENOW (2005) who uncover important differences in the way how trade growth manifests itself for rich and poor countries, respectively. Poor countries tend to increase their trade by exporting higher quantities per variety at about constant prices, an explanation that would be consistent with a geographic spread of trade in existing products for which fixed costs have once been overcome.

The existence of fixed cost to exporting is well established (BERNARD and JENSEN, 2004; BERNARD and WAGNER, 2001; ROBERTS and TYBOUT, 1997). Neither paper, however, uses a combination of geographic and product variation in exports to further characterize fixed costs, as is the focus of this paper. DAS ET AL. (2006) develop a model in which firms face both sunk start-up costs to initiate exports and per-period fixed costs to maintain foreign market presence. Using Colombian firm-level data, they quantify start-up costs in the range of 300,000 to 400,000 US dollars (depending on firms size), while period fixed costs appear, on average, to be negligible. They also point out that the evolution of the extensive margin (at the firm level) might be industry specific, i.e. when many firms are clustered “near” a break-even cost threshold, market entry is an important response margin, whereas in a more cost-heterogeneous industry less firms are on the brink of starting to export. Focusing on the cost side of the profit condition that determines firms’ export decisions, DEBAERE and MOSTASHARI (2005) confirm the hypothesis that the extensive margin is responsive to tariff variation. Applying a count measure of variety, their probit estimations show that both tariffs and tariff preferences, i.e. particularly the relative position to other countries, significantly influence the extensive margin of countries’ exports to the U.S. While they concede that the overall contribution of preferences is relatively small, some Eastern European

countries exhibit a more pronounced response when tariff cuts are deeper, suggesting threshold effects that would be consistent with the existence of fixed costs.

Conceptually, EVENETT and VENABLES (2002) propose a model in which fixed costs of market entry depend on past export performance in (possibly many) markets, though their study features a quite different mechanism. Their hypothesis for explaining the disappearance of zero trade flows centers on the notion of export markets’ “similarity”, which is empirically captured by geographic and linguistic measures of proximity. Therefore, their mechanism is driven by destination market characteristics rather than product specific sunk costs and positive shocks to variable trade costs. The implications for empirical verification, in terms of sampling and time horizon, are clearly different. EVENETT and VENABLES find that the predominant form of learning occurs through proximity to the supply frontier, i.e. distance to markets previously supplied turns out as the relatively most important channel. This demand side mechanism does not preclude the existence of supply side effects that attribute the spread of trade to shocks from preferential market access.

2 Modeling Fixed Costs and the Extensive Margin

The model’s demand side is given by the familiar CES framework whereas the supply side is characterized by the explicit formulation of product specific fixed costs. Modeling a firm’s export market participation draws on CLERIDES ET AL. (1998) and ROBERTS and TYBOUT (1997), that is trade decisions are made in a dynamic discrete choice model in which exporting is based on a comprehensive profit condition. It is not a model of variety, and its purpose is not—as in ROMER (1994)—to endogenously determine the number of goods. However, the number of varieties the representative country is exporting responds to changes in trade costs, namely preferential market access. Once a certain product switches its status from non-traded to traded, the exporter can subsequently capitalize on the sunk costs of exporting, which in turn causes

the spectrum of traded products to expand further over time.

The hypothesis of the geographic spread of exports is framed from the perspective of a single exporting country; throughout the analysis, let s and d denote the indices for an exporting and destination country, respectively. Assume there is a measure of I industries in the economy, and products within each industry i are differentiated according to country of origin. An importing country thus demands varieties from $s \in 1, \dots, S$ countries according to the following two-tiered utility function

$$U_d = \left[\int_0^I C(i) di \right]^\beta C_d^{1-\beta}; \quad C(i) = \left(\sum_s^S c_{is}^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}} \quad (1)$$

in which utility is derived from a composite good $C(i)$ that consists of a CES aggregate of S imported product varieties. Note that the elasticity of substitution, σ , pertains to the Armington varieties in industry i . C_d denotes the domestic numeraire good. Based on the demand schedule from maximizing utility, monopolistically competitive producers in the exporting country set prices as a markup over marginal cost. Let mc_{ifs} denote the marginal cost of firm f in industry i and exporting from country s . Hence, the delivered price equals $p_{ifs} = \frac{\sigma}{\sigma-1}(1 + \tau_{id}^s) \cdot mc_{ifs}$, which includes an exporter-specific tariff, τ_{id}^s , that the importing country d might levy on good i from exporter s . With markup pricing, demand for a specific product is then given by

$$c_{ifs}(p) = \left[(1 + \tau_{id}^s) \frac{\sigma}{\sigma-1} mc_{ifs} \right]^{-\sigma} C(i) \underbrace{\left[\int_i C(i) di \right]^\sigma}_{\equiv \gamma} \quad (2)$$

It can be shown that, as we should expect, $\frac{\partial p_{ifs}}{\partial \tau_{id}^s} > 0$ and $\frac{\partial c_{ifs}}{\partial \tau_{id}^s} < 0$.

At the firm level (conditional on industry and country), marginal costs obey the following specification:

$$mc_{ifs} = (1 + \eta_f)w; \quad \eta \sim \text{lognormal} \quad (3)$$

in which w is the wage rate and η is a lognormally distributed random variable. When firms are ordered along the efficiency dimension, the least cost supplier (with $\eta^{(0)} = 0$) faces marginal costs equal to the wage rate while all others incur higher production costs. In the current CES framework, the ordering of firms from low to high cost supplier carries over to good i 's delivered prices in country d . Moreover, since fixed costs—to be specified below—are the same for all firms, there also exists a unique ordering of firms' profits, π_{ifd} , which are inversely related to their efficiency draw, η_f . To illustrate, Figure 1 depicts the relationship between profits and efficiency in a stylized manner. Shifting the profit curve is associated with more firms exporting, i.e. a growth in the extensive margin at the firm level, though that process might be hidden when only country level trade data is available.

Therefore, in the adopted framework cost heterogeneity at the firm level leads to a *monotonic inverse* relationship between firms' profits and efficiency. Hence, predictions that arise from a single firm's zero profit condition, namely whether or not it should start exporting, can be easily aggregated and thus carry over to the country level. This is essential when theoretical implications are framed in terms of probability changes at the firm level but the empirical test is based on country-level data. Clearly, though, we still need to assume that markets—in the sense of exporter–product combinations—clear one by one, which rules out intertemporal cross-subsidization on the part of multi-product firms.¹ Nonetheless, the restrictiveness of this assumption obviously slackens with the length of the time horizon considered.

Next turn to the explicit specification of fixed costs to exporting. Suppose shipping good i from any country to the importer under consideration involves product specific fixed costs, F_i , which are sunk afterwards. We could think of these costs as tailoring the product to foreign tastes, ensure compliance with international standards and regulations, or as overseas marketing outlays for this particular good. These product

¹As a consequence of substantial sunk entry costs, DAS ET AL. (2006) find that Colombian firms tend to continue exporting even when current net profits are temporarily negative so as to avoid incurring start-up costs again. By the same token, the option value of being able to export appears important for the decision of when to start exporting.

specific fixed costs are a decreasing function of the number of export markets served, that is $F_i(d \in D)$, $\frac{\partial F_i}{\partial d} < 0$. In the simplest case, let these costs be a step function such that they equal a fixed dollar amount A when first encountered and zero afterwards. In this polar case,

$$F_i = \begin{cases} A & \text{if } c_{id} = 0 \quad \forall d \in D; \\ 0 & \text{otherwise.} \end{cases} \quad (4)$$

The profit function for product i to be shipped to destination d , as a function of fixed costs and local tariffs, can then be stated as

$$\begin{aligned} \pi_{ifd}(\tau, F) &= \left(\frac{p_{ifd}}{(1 + \tau_{id}^s)} - mc_f \right) c_{id} - F_i(c_{id}) \\ &= \underbrace{\sigma^{-\sigma} (1 - \sigma)^{1-\sigma} \gamma \cdot (1 + \tau_{id}^s)^{-\sigma} \cdot mc_f^{1-\sigma}}_{\equiv R(\tau_{id}^s, \gamma)} - F_i(D) \end{aligned} \quad (5)$$

in which $R(\tau_{id}^s, \gamma)$ represents ‘operating profits’ net of tariffs and marginal costs but excluding fixed costs. It can be verified that $\frac{\partial \pi_{ifd}}{\partial \tau_{id}^s} < 0$, i.e. tariff rate cuts applicable to imports from s on the part of country d unambiguously raise the exporting firm’s profits. The key implication though is that the following equation holds as well.

$$\frac{\partial \pi_{ifk}}{\partial \tau_{id}^s} < 0 \quad \forall k \neq d \quad (6)$$

That is, profits derived from exporting to any alternative destination $k \neq d$ rise as well in response to a tariff cut on the part of country d towards exporter s , $\Delta \tau_{id}^s < 0$. The reason is that product specific fixed costs, $F_i(D)$, are a function of the set D of all potential export destinations. Since fixed costs are decreasing in export quantities, and the latter are in turn decreasing in tariffs, the result in eq. (6) follows. This is a necessary (though not sufficient) condition for the geographic spread of trade. Whether or not such tariff cuts are sufficiently high to render a product profitable depends on a host of other factors, but the salient point is that it unambiguously increases the

probability thereof.

Eq. (6) establishes the impact of (preferential) tariff cuts on the evolution of the beneficiary country's extensive margin with respect to *third* markets. The response in the exporting country's trade portfolio following a tariff cut can be brought about along two different margins: first, it might now turn out to be profitable to ship good i to destination d . Second, after having recouped the product specific fixed costs, that same product could now be shipped to additional destinations other than d , denoted by k . Let two indicator variables y_{idt} , y_{ikt} , respectively, denote whether or not exports at time t take place with respect to those two different channels. Instantaneous profit maximization by firms at time t then obeys

$$\begin{aligned} \max_{y_{idt}, y_{ikt}} \pi(\tau, F) = & \quad y_{idt} \cdot \left[R(\tau_{id}^s) - (1 - y_{idt-1}) (F_i + F_d) \right] \\ & + y_{ikt} \cdot \left[R(\tau_{ik}^s) - (1 - y_{idt-1}) F_i - (1 - y_{ikt-1}) F_k \right] \end{aligned} \quad (7)$$

The terms F_d, F_k denote other kinds of fixed costs, e.g. costs that are destination specific or that are incurred anew in each period. Those terms are not of particular interest for the present question but their existence is clearly suggested by EATON ET AL.'s (2004) finding that most products are shipped to at most one destination. Obviously the decision problem takes on this simple form only when the fixed costs are binary and when optimization is static.²

Provided that as of time $t - 1$ good i is not yet exported to a third country k , potential dynamic effects manifest themselves exclusively along the extensive margin. Since the primary interest lies in such third party effects, the first-order condition associated with country k is directly read off the maximization problem:

$$y_{ikt} : \quad R(\tau_{id}^s, \tau_{ik}^s) \geq \left(1 - y_{idt-1}(\tau_{id}^s) \right) F_i + \left(1 - y_{ikt-1}(\tau_{ik}^s) \right) F_k \quad (8)$$

Notice that the operating profits stemming from a third market k depend on τ_{id}^s .

²Forward-looking decision making would as well incorporate future net benefits from exporting today, and might thus lead to positive exports even when current profits are negative.

Hence, exploring whether the combination of tariff cuts and fixed costs can provide an explanation for the extensive margin to expand is tantamount to testing whether τ_{id}^s , or some lags thereof, enter significantly in an equation that determines export flows from country s to k . In that regard it is not so much the trivial structure of the FOCs that will be exploited empirically but rather their ‘triangular’ and possibly dynamic intertemporal relationship given a decline in τ_{id}^s is being observed: first, such a tariff reduction has the obvious own-product effect on y_{idt} . This could occur either on the intensive margin when good i has already been shipped, or could cause good i to be exported for the first time. Moreover, in the presence of product specific fixed costs, y_{idt-1} positively affects y_{ikt} according to eq. (8), i.e. a cross-market effect of tariffs that induces the geographic spread of trade. Note that the model prediction hinges on both the initial shock to variable trade costs *and* on the presence of a particular kind of sunk cost. This tight structure should facilitate a causal interpretation of trade patterns observed under a preferential trading regime. Equally important, product specific tariff reductions on the part of country d are arguably exogenous to observed and unobserved factors that determine trade by exporter s with third countries, y_{ikt} . The triangular structure alleviates much of the endogeneity problems that usually afflict trade policy variables.

Thus the vector of the export status variable obeys a discrete dynamic process. Combining with the FOCs from above makes the probability of good i to be geographically spread out to an additional destination k a function of tariff rates

$$\Pr(y_{ikt} = 1 | \gamma) = \Pr\left(R(\tau_{ik}^s) - (1 - y_{idt-1})F_i - (1 - y_{ikt-1})F_k > 0 | \gamma\right) \quad (9)$$

Notice in particular the key implication

$$\Pr(y_{ikt} = 1 | y_{idt-1} = 1) > \Pr(y_{ikt} = 1 | y_{idt-1} = 0) \quad (10)$$

That is, previously exporting product i to d raises the probability of that good being subsequently exported to k as well, thus capturing the bridgehead effect that is induced

by product specific fixed costs. The model prediction in eq. (10) will be the starting point for all of the three alternative empirical specifications that are derived in the next section.

3 Econometric Specifications

3.1 Cross-Sectional Estimation

The first approach derives a static reduced form specification from eq. (10) by taking “long differences” between two points in time around NAFTA’s inception. Here I just assume that the spread of exports does take place sometime in between that interval, leaving the exact lag structure unspecified.³ Consider a normalization of Mexican export flows on its total exports, i.e. world exports except for the US. After rearranging, that approach is effectively tantamount to regressing excess growth rates of exports to a third market on the excess growth rate of exports to the US.

For an estimable equation start from

$$\begin{aligned}
\ln\left(\frac{X_{i,t1}^C}{X_{i,t1}^W}\right) - \ln\left(\frac{X_{i,t0}^C}{X_{i,t0}^W}\right) &= \alpha + \beta_1 \left[\ln\left(\frac{X_{i,t1}^{US}}{X_{i,t1}^W}\right) - \ln\left(\frac{X_{i,t0}^{US}}{X_{i,t0}^W}\right) \right] \\
&+ \beta_3 \ln\left(\frac{(1 + \tau_{i,t1}^{Mex})}{(1 + \tau_{i,t0}^{Mex})}\right) + \beta_4 \ln\left(\frac{(1 + \tau_{i,t1}^{MFN})}{(1 + \tau_{i,t0}^{MFN})}\right) \\
&+ \beta_5 \left[\ln\left(\frac{(1 + \tau_{i,t1}^{Mex})}{(1 + \tau_{i,t0}^{Mex})}\right) \times \ln\left(\frac{X_{i,t1}^{US}}{X_{i,t0}^{US}}\right) \right] \\
&+ \beta_6 \left[\ln\left(\frac{(1 + \tau_{i,t1}^{MFN})}{(1 + \tau_{i,t0}^{MFN})}\right) \times \ln\left(\frac{X_{i,t1}^{US}}{X_{i,t0}^{US}}\right) \right] + \varepsilon_{i,t}
\end{aligned}$$

³Likewise, a non-structural approach is also taken by BERNARD and JENSEN (2004); CLERIDES ET AL. (1998); BERNARD and WAGNER (2001) and ROBERTS and TYBOUT (1997).

which is equivalent to

$$\ln \left(\frac{X_{i,t1}^C}{X_{i,t0}^C} \right) - \ln \left(\frac{X_{i,t1}^W}{X_{i,t0}^W} \right) = \alpha + \beta_1 \ln \left(\frac{X_{i,t1}^{US}}{X_{i,t0}^{US}} \right) - \beta_2 \ln \left(\frac{X_{i,t1}^W}{X_{i,t0}^W} \right) + [\dots] \quad (11)$$

In this form the left-hand side has an immediate interpretation as the excess growth rate of Mexican exports to a third market c over rest-of-world (RoW) exports (ex USA). Normalization by world exports, $X_{i,t}^W$, eliminates all product-specific (demand or supply side) shocks, including proportional measurement error at the tariff line level.⁴ Dates t_0, t_1 define the long difference; the starting point is always $t_0 = 1993$ whereas t_1 ranges from 1995 to 2000 so as to trace out the evolution of effects over time.

The expected signs of coefficients are as follows. The coefficient β_2 will be negative by construction.⁵ Next, NAFTA tariff cuts constitute a preferential market access for Mexican goods and, and a positive sign of β_3 means that at the same time third market exports are shrinking, which is thus evidence of some sort of short-run supply capacity constraint on the part of Mexico. Conversely, as the US lowers its MFN rates, other countries gain relatively better market access and might replace Mexican exports to the US, thus β_4 is expected to be negative. The last two terms are interaction effects between the growth in US exports and the change in Mexican and MFN tariff rates, respectively. They allow for the possibility to more clearly separate on the one hand the effect of US exports that is triggered by tariff changes from the (positive) bridgehead effect of US exports on the other hand. When NAFTA preferential tariff cuts absorb exports destined for third market c and thus depress exports to that destination, β_5 is expected to be positive. Lastly, Mexican exports to the US might be replaced by other suppliers following a decline in the US MFN rate, but it is not a priori clear whether

⁴Destination-specific measurement error could potentially be problem but is probably washed out by aggregation as $X_{i,t}^W$ consists of a large number of countries.

⁵The high model fit is a direct consequence of the normalization by world exports. As the coefficient on RoW exports approaches -1 the R^2 rises accordingly, thus no particular meaning or significance is attached to the value of that statistic. The prime purpose is not to achieve a high model fit but to control for product-specific shocks and a time trend by constructing excess growth rates of exports.

those goods then are not exported in the first place or whether they get exported to an alternative destination. In the latter case, the excess growth rate of exports to country c as the dependent variable will generally decrease unless those goods are deflected exactly to country c . For the case of pooled estimations in which c refers to the Latin American region, a positive sign on β_6 indicates trade diversion to that same region whereas a negative sign suggests that exports displaced by MFN reductions were directed elsewhere to rest of world destinations. Hence, the changes in tariffs and the interaction terms together capture the trade diverting effects in Mexican exports to third countries and are thus important control variables. It is only after accounting for these trade diversion effects plus any product specific shocks and measurement errors and overall export growth, that an *additionally* discernible positive effect of US exports on third country exports is evidence of a geographic spread of Mexican exports following the NAFTA experience.

3.2 Extensive Margin Decomposition

Instead of using the discrete change from non-exports to exports, as would have been natural for an analysis of the extensive margin, the previous section's specification regresses third country trade flows on US trade flows because there is hardly any variation in the discrete count measure in the Mexican–US trade relationship. In order to bolster the inference as to the positive impact of US exports on third market exports, I now employ an index measure of the extensive margin developed by FEENSTRA and KEE (2005) and HUMMELS and KLENOW (2005). The finding that Mexican exports to the US exhibit predictive power for this alternative formulation of the extensive margin lends further support to the hypothesis of a geographic spread of trade.

Since the measure of product variety in both papers mentioned above is framed from an importing country's perspective, an index of the extensive margin that is appropriate for the present analysis must first be adapted so as to be stated from an exporter's point of view. Start from the excess growth rate of Mexican exports which forms the

dependent variable in eq. (11).

$$\text{Dep. Variable} = \ln \left(\frac{X_{i,t1}^C}{X_{i,t0}^C} \right) - \ln \left(\frac{X_{i,t1}^W}{X_{i,t0}^W} \right) \quad (12)$$

As in FEENSTRA and KEE (2005), define by I_t^x , $x \in \{C, W\}$ the set of good that Mexico exports at time t to any country (C) or to the World (W). The union of both, henceforth called the common set, does not carry a superscript, i.e. $I_t^C \cup I_t^W = I$. Adapting the measures proposed in FEENSTRA and KEE (2005); HUMMELS and KLENOW (2005) to capture one single country's export variety, define the extensive (EM) and intensive (IM) margin, respectively, as follows:

$$\text{EM}_{c,t} = \frac{\sum_{i \in I^C} X_{i,t}^W}{\sum_{i \in I^W} X_{i,t}^W}, \quad \text{IM}_{c,t} = \frac{\sum_{i \in I^C} X_{i,t}^C}{\sum_{i \in I^C} X_{i,t}^W} \quad (13)$$

Aggregating the HS 6-digit trade flows up to the HS Section level and using the above definitions, the dependent variable in eq. (12) can, at each point in time, be decomposed into an extensive and intensive margin component.

$$\ln \left(\frac{\sum_{i \in I^C} X_{i,t1}^C}{\sum_{i \in I^W} X_{i,t1}^W} \div \frac{\sum_{i \in I^C} X_{i,t0}^C}{\sum_{i \in I^W} X_{i,t0}^W} \right) = \ln \left(\frac{\text{EM}_{C,t1}}{\text{EM}_{C,t0}} \right) + \ln \left(\frac{\text{IM}_{C,t1}}{\text{IM}_{C,t0}} \right) \quad (14)$$

I have now transformed the excess growth rate of exports between two points in time into changes that are due to movements in the extensive margin and those that result from changes in the intensive margin of trade. The right hand side of the estimable equation stays the same as in eq. (11) since we are still interested in the effect of exports to the US while controlling for tariff changes. The added benefit of the proposed decomposition is that the coefficients from estimating the EM and IM model, respectively, will exactly add up to the coefficients that obtain from using the excess growth rate as a dependent variable. This feature allows for a straightforward

appreciation of the role of the extensive margin in driving Mexican exports to third markets.

3.3 Discrete Choice Panel Estimation

In a binary choice model of a good's export status the testable prediction that emerges from eq. (10) may be captured by the following specification.

$$\Pr(y_{ict} = 1 | Z_i, \mu_i, n_i = n) = G(\beta Z_{it-1} + \mu_i) \quad (15)$$

This is the fixed effects (FE) conditional logit estimator with unobserved effects. The dependent variable y_{ict} is a binary indicator that takes on the value of 1 if Mexican exports of product i to country c at time t are positive, and 0 otherwise. $G(\cdot)$ represents the conditional logistic distribution function. In the logit case the sum $n_i = \sum_t y_{it}$ is a sufficient statistic for the unobserved effect μ_i so that the joint distribution of y_i conditional on $(Z_i, \mu_i, n_i = n)$ does not depend any longer on the unobserved effect (hence FE estimator since the conditional logit model accommodates arbitrary correlation between unobserved effects and covariates). This attractive feature affords robustness in the sense that the relationship between unobserved individual effects and independent variables can be left unrestricted. The matrix of covariates, Z_{it-1} , includes the same data as in the previous section, namely the value of exports to the US, X_{it-1}^{US} , as well as US–Mexican and US–MFN tariff rates, $(1 + \tau_{it-1}^{Mex})$ and $(1 + \tau_{it-1}^{MFN})$, respectively, plus a full set of time dummy variables.

Due to the properties of binary choice panel data models the following remarks apply. First, by conditioning on the sufficient statistic n those observations whose outcome does not change over time (all zero or all ones) will not contribute to the likelihood function and will thus drop out. Second, in a pooled estimation over 16 Latin American destinations the cross-sectional units are given by (product \times country) combinations whose outcome is then tracked over several years. Notice then that any

variable that does not vary within those panel units will be collinear and will thus drop out. This feature of the conditional logit functional form—which by the same token delivers the desirable independence from unobserved effects—precludes the estimation of a constant, of country fixed effects, or any of the country-specific variables employed in the pooled ‘long difference’ approach above. It is always possible, though, to run the pooled specification on subsamples that are stratified across skill, technology, income or other interesting dimensions. The fact that the data pertains to the country level rather than the firm level calls for some flexibility in implementing eq. (15). For instance, what constitutes “one time period” from an exporter’s point of view is not likely to coincide with the annual frequency with which trade data is collected. Regarding the empirical analog of eq. (15) it is therefore advisable to experiment with different lag structures (including current values) of the variables involved.

In contrast to the long difference approach, the panel estimation enforces much more structure on the data in that the exporting status to third markets is rigorously tied to the variation of US exports in the time dimension. It therefore gets considerably closer to interpreting the positive impact of US exports on subsequent exports in a causal sense. However, since there is rarely a free lunch, the price to be paid for accommodating arbitrary correlation between unobserved effects and covariates is the inability to calculate (average) partial effects on the response probability. Hence, the discrete panel data approach and the long difference specification are clearly complementary in that the former’s inference as to sign and significance underscores the causal interpretation whereas the latter provides some sense of the marginal effect involved.

4 Estimating Mexico’s Spread of Exports

The inception of NAFTA in 1994 provides an excellent case for studying the dynamic effects of a one-shot decline in variable trade costs. Although Mexico’s NAFTA experience has been widely researched there is, to the best of my knowledge, no empirical evidence yet on the impact that NAFTA tariff reductions exerted on Mexico’s exports

toward non-NAFTA partners. Indeed, for a number of countries (though not for all trading partners) a geographic spread of those goods can be observed that initially benefited from preferential tariff reductions under NAFTA.

4.1 Data

Data on trade flows and trade costs, especially applicable effective tariff rates, are sufficient to assess the hypotheses derived above. The United States' NAFTA tariff rates towards Mexico are obtained from the data base "U.S. Tariffs Light, 1989–2001", compiled by John Romalis and available on the NBER's International Trade Data website.⁶ Tariffs are recorded at the 8 digit level of the Harmonized Tariff Schedule of the United States (HTS), and are subsequently aggregated to the HS-6 digit level to ensure compatibility with trade data. Data include the most favoured nation (MFN) tariff per product as well as an estimated ad valorem equivalent (AVE) for Mexican imports, based on both the ad valorem and the specific portion of Mexico's NAFTA preferences. A major advantage of this data base, which is particularly vital when analyzing the extensive margin, is that it also provides information on applicable tariff rates even when no trade is observed. Without this feature, exactly those tariff line observations would be lost that switch their status at some point from non-traded to traded. However, precisely these tariff lines embody the variation needed for identification.

Mexican export data is retrieved from the OECD *International Trade by Commodity Statistics* data base. Trade flows classified by the HS Rev. 2 scheme are available at the HS-6 digit level. Apart from the US, the country coverage in this study spans 16 Central and South American countries.⁷ Table (1) documents the rapid change in Mexico's export structure in the aftermath of NAFTA towards an array of Latin

⁶Or directly from <http://gsbwww.uchicago.edu/fac/john.romalis/research/TariffL.ZIP>.

⁷Central and South American countries include: Argentina (ARG), Bolivia (BOL), Brazil (BRA), Chile (CHL), Colombia (COL), Costa Rica (CRI), Dominican Republic (DOM), Ecuador (ECU), Guatemala (GTM), Honduras (HND), Nicaragua (NIC), Panama excl. Canal Strip (PAN), Peru (PER), El Salvador (SLV), Uruguay (URY) and Venezuela (VEN).

American trading partners for the reference period 1993–97. The table lists a count measure of products continuously traded with each country and overall trade growth in those product lines, plus the number newly traded goods and their share in terms of 1997 trade as well as the number of “dying” products and their share in 1993 trade.

Even though the figures are not benchmarked against a longer-term trend or the average duration of export spells, the growth in the extensive margin of Mexican exports after 1994 seems stunning, and often represents a manifold of the number of already traded products. Of the 16 Latin American countries considered, seven turn out to receive more than 1,000 new product lines from Mexico in 1997 (Guatemala, Costa Rica, Chile, Venezuela, Colombia, Panama and El Salvador, in descending order). Invariably, new goods account for at least one third of export volume in 1997. Consider, for instance, Guatemala in Table (1) which records the highest number of newly traded products, even though its figure of continuously traded goods is already large (second only to the US). Trade in those goods grew by 272 percent over the 4 years covered, while 1,307 new HS-6 digit lines were added to the Mexico–Guatemala trade relation, accounting for slightly more than one quarter in 1997 bilateral trade. Another 200 product lines ceased to be traded which contributed about 10 percent to the initial 1993 bilateral trade volume, leaving a net increase of 1,107 product lines.⁸ When a 3-year range is considered instead of a point in time alone (i.e. products not traded in 1993 but traded in all three years 1996–98), the numbers come down somewhat but the result remains qualitatively unchanged, meaning that the number of entries is roughly at least as high as the number of already exported goods. Figures are based on the broadest possible sample, i.e. exclusively on trade data *before* merging in tariff and wage data.

In order to characterize further the geographic spread of Mexican trade, I furnish a

⁸Note that a number of additional statistics can be calculated from the figures in Table 1: since the total number of products equals 4,995 (for all countries), we can infer the number of persistent zero trade entries for Guatemala as $4,995 - (1,1181 + 200) = 3,614$. Furthermore, although trade growth at the intensive margin—in a geographic sense—surged by +272 percent, the trade share of products continuously traded fell from $(100 - 9.5) = 90.5$ percent in 1993 to $(100 - 27.9) = 72.1$ percent in 1997, due to the hefty increase in goods not previously traded.

graphical decomposition of trade flows in terms of products' skill content. Figure (2) depicts the percentage shares of three skill categories for the subsample of newly traded products.⁹ The skill content of new goods has some interesting features. The two countries that seem to benefit from exports to the US—Chile and Costa Rica—are both at the lower end of the table and therefore resemble the position of the US, which ranks last in terms of high-skilled products.¹⁰ In contrast, the new goods exported to smaller economies like Guatemala, El Salvador, Honduras, Panama and Bolivia seem to experience a reshuffling towards more sophisticated goods. Apparently there are a few product lines of a higher skill category that make for a 'volume effect' that is rather different from what a count measure would suggest.

4.2 Results

Empirical estimates of the long difference specification between 1993–1997, as derived in section 3.1, are presented in Table (2).¹¹ The model is pooled across countries, controls for country fixed effects, and explores systematic differences across countries in terms of income, size, distance, and R&D expenditures. The main result is that the pooled specification underscores the finding of a geographic spread of trade. It is, to the best of my knowledge, the first direct empirical evidence of a “geographic spread of trade” triggered by a particular preferential tariff liberalization. The change in US exports has a highly significant impact on excess growth rates of exports to third markets in Central and Latin America. Tariff-induced trade diversion, from both NAFTA and MFN rates, is highly significant as well. The positive bridgehead effect of US exports increases with a rise in the third country's per capita income and size and

⁹The figure does not provide a complete break-down of total exports as for some industries no wage data is available (445 products). Moreover, note that in addition to 'newly traded' products there are also 'continuously traded', 'continuously non-traded' and 'dying' products, thus the subsample mapped out here does not exhaust total exports in 1997.

¹⁰It should be noted that subsequent merging of different data sets leads to an increasing loss of observations, which has consequences for the ranking of countries in such a figure.

¹¹Analogous tables have been compiled for the years 1995, 1998 and 2000 but are omitted for space reasons.

decreases with the destination market’s distance from Mexico.¹²

Moreover, the range of traded goods has been stratified along its skill and technology content, respectively, and the pooled specification has been rerun on different subsamples of goods, e.g. on low-skilled or high-technology goods, to further characterize the channel through which the bridgehead effect works.¹³ In terms of products’ skill content the trade-enhancing impact of US exports is strongest in high-skilled goods and smallest in low-skilled ones (columns 2–4). Furthermore, the positive sign on US–Mexico tariff rates and the negative one on US MFN rates suggest considerable tariff-induced trade diversion (a decrease in NAFTA tariffs faced by Mexico suppresses Mexican exports to third markets). A similar picture emerges when the sample is split according to technology content (columns 5–8). US exports exert the strongest impact for high-tech goods. In contrast, exports to the US in resource-based goods are uncorrelated with third market exports. The destination countries’ R&D expenditures exhibit an interesting pattern: its effect is negative for low skilled and low tech goods but strongly positive for medium skilled and medium tech goods. This finding is quite intuitive and suggests that R&D expenditures might usefully proxy the country’s similarity with the advanced US market. This is in line with the hypothesis that it is US exports that trigger further shipments to other countries and not common background factors.

Next consider the findings for the extensive margin decomposition. The data that corresponds to eq. (3.2) in section 3.2 is pooled across sectors and countries, resulting in some 304 observations (19 HS Sections \times 16 countries). The results for the 1997/93 period are presented in Table (4). The first column effectively resembles the pooled

¹²Country-by-country results are reported in Table (6). The core result that exporting a given product to the US has a positive effect on its exports to third markets is replicated at the country level, including a substantial direct “crowding out” effect of US tariff changes. The negative impact of tariff cuts on third country exports depends on the magnitude of the change in exports to the US precisely because the latter assume those resources that are not available any longer for exports to third markets.

¹³Skill is proxied by the average wage in 1990 US dollars per hour paid in the respective industry, and the three categories ‘low skilled’, ‘medium skilled’ and ‘high skilled’ refer to wage intervals (5, 10], (10, 15] and (15, 22] dollars/hour. The technology classification is based on LALL (2000). I thank David Hummels for access to this data.

estimation as in Table (2) but at the HS Section level instead of being estimated from HS 6-digit lines. In the second column—the extensive margin (EM) model—the coefficient on US exports is positive and significant while in column 3—the intensive margin (IM) part—it is not. Hence, the results boldly support the hypothesis that Mexican exports to the US did promote exports to other Latin American countries via the extensive margin channel. The fact that prior US exports turn out to be fairly uncorrelated with a measure of the intensive margin suggests that broadening the range of traded goods indeed seems to be the primary adjustment margin of Mexican exports after NAFTA.¹⁴ The combination of extensive margin mechanism and traditional tariff-induced trade diversion, as alluded to in the previous section, also rationalizes the negative sign on the tariff variables. NAFTA tariff cuts induce Mexico to export more to the US, and to the extent that the range of goods traded with third markets also expands these increased trade volumes will show up in a higher value of the extensive margin, which by definition is measured as world exports in the set of goods exported to a given third country. This channel by which preferential tariff cuts raise the extensive margin is reflected in the negative sign on the change in US–Mexican tariff rates.

The decomposition exercise may equally well be performed on a finer level of aggregation, with product variety then being calculated at the HS 2-digit level from HS 6-digit trade flows. The coefficients thus obtained are somewhat smaller in magnitude but the findings remain qualitatively unchanged. Secondly, one can trace out the extensive margin’s impact over time. Here it seems that the EM response was strong in the immediate aftermath of NAFTA but petered out later. Lastly, it is worthwhile pointing out that the pooling over countries hides the fact that despite an overall insignificant coefficient for US exports in later years (for instance in 2000), the impact is still highly significant for individual countries, e.g. Bolivia, Brazil, Ecuador, Honduras,

¹⁴Note that the extensive margin is likely to be underestimated. By construction the extensive margin cannot be calculated in cases in which there are exclusively zero trade flows within a given sector. This is the case for some sectors in the base year 1993 while it is never the case in 1997. These instances, however, are exactly those sectors that by definition feature an increase in the extensive margin. Due to the summation at the sectoral level this problem is of minor significance though.

Costa Rica.¹⁵

Finally consider the results obtained by discrete choice panel data estimation, as presented in Table (5). The set of covariates again includes Mexican exports to the US, US–Mexico and US–MFN tariff rates, as well as time dummies. Recall that the cross-sectional units are product \times country combinations so that the unobserved effects already absorb the set of country dummies. Tariff variables include one lag relative to US exports in order to capture both the pure trade diverting effect as well as the lagged indirect effect from the conjectured mechanism that runs via increased US exports.

The first column contains the results from the entire sample pooled over 16 third export destinations. It is reassuring to find that the panel estimation supports as well the hypothesis of a geographic spread of trade. On top of the tariff variables, exports to the US exert a positive impact on the status whether or not to export a product to a third destination as well. The coefficient itself is small but the absolute magnitude of point estimates does not have any meaning in conditional fixed effect logit estimation. Moreover, the finding that US–Mexican tariffs switch sign between the contemporaneous and lagged variable exactly conforms to the predictions of the conjectured mechanism. Recall that the lagged variable’s negative sign indicates that NAFTA tariff cuts *increase* the probability of a good being shipped to a third country. Therefore the results quite intuitively suggest that the current variable captures Mexico’s supply capacity constraint whereas the lagged variable reflects the postulated knock-on effect.

The mechanics of the conditional logit panel estimator preclude estimating the effect of time-invariant variables, so we have to forgo the direct inclusion of country and product specific variables, as was done in the long difference and extensive margin specifications. It is still possible though to cut the data along those dimensions to further inquire into the sources of heterogeneity among destination countries. The remaining columns of Table (5) report the results from different subsamples. US exports

¹⁵Countrywise results are not reported to conserve space but are available upon request.

appear significant for exports to countries with a lower per capita income, and highly so for countries with above-average expenditures on R&D. The effect of the products' skill content is rather uniformly spread out across low, medium and high skilled goods. In contrast, there is a marked trade effect for low-tech and medium-tech goods only.

In line with the conjectured mechanism, the effect of US exports in the subsample of high R&D countries might reflect the destination's similarity with the advanced US market to which the goods have initially been shipped. Nonetheless it is predominately low-tech goods for which the US acts as a bridgehead to additional markets. Note also that the coefficient on lagged Mexican tariffs is of opposite sign for low and high tech goods, respectively. In contrast to the negative sign for low tech goods (positive impact), the positive sign for sophisticated goods suggests that the supply capacity constraint is much more binding than for low tech goods.

5 Conclusions

Mexico's post-NAFTA export pattern sees a huge increase in the extensive margin, i.e. a host of new products is being shipped to Central and Latin American destinations. The main result of this paper demonstrates that export flows from Mexico to the US have predictive power for the subsequent shipment of those products to additional markets. In order to identify the impact of exports to the US on third destinations—thus verifying the geographic spread of trade—three complementary approaches are implemented. The 'long difference' specification surrounding NAFTA's tariff cuts constructs excess growth rates to alternative destinations relative to world exports and thus effectively controls for all product-specific shocks. A decomposition of excess growth rates into FEENSTRA-type indices of extensive and intensive margin underscores the predominant role of the former as a response margin, and conditional logit panel estimations exploit the time dimension to pinpoint the conjectured bridgehead effect.

I find that changes in US tariff rates—both preferential rates towards Mexico as well

as US MFN rates—exert a profound impact on Mexican patterns. Two developments are simultaneously ongoing. The first stage immediately following NAFTA’s inception is characterized by a re-direction of Mexican trade toward the US and a gradually unfolding crowding-out of its exports to neighboring Latin American trade partners. The results appear to be consistent with a capacity constraint on the part of Mexico as a supplier. Simultaneously, exporting a given product to the US has a positive effect on Mexican exports to third markets, even after accounting for product-specific shocks and the overall growth of Mexican exports. This phenomenon is consistent with the existence of product-specific sunk costs of exporting and is, to the best of my knowledge, the first direct empirical evidence of a “geographic spread of trade” triggered by a particular instance of preferential tariff liberalization. The positive impact of US exports takes more time to materialize than the immediate tariff change impact. Hence, in the presence of product specific fixed costs a shock in variable trade costs may yield important dynamic effects as it may lead to a path dependency of those exports that were initially stimulated by, for instance, a preferential tariff cut. The positive and significant effect of exports to the US emerges despite the inclusion of country dummy variables. This finding is important as it suggests that the correlation is not spurious in that it would pick up unilateral liberalization efforts of Mexico’s export partners as they implement their Uruguay Round commitments.

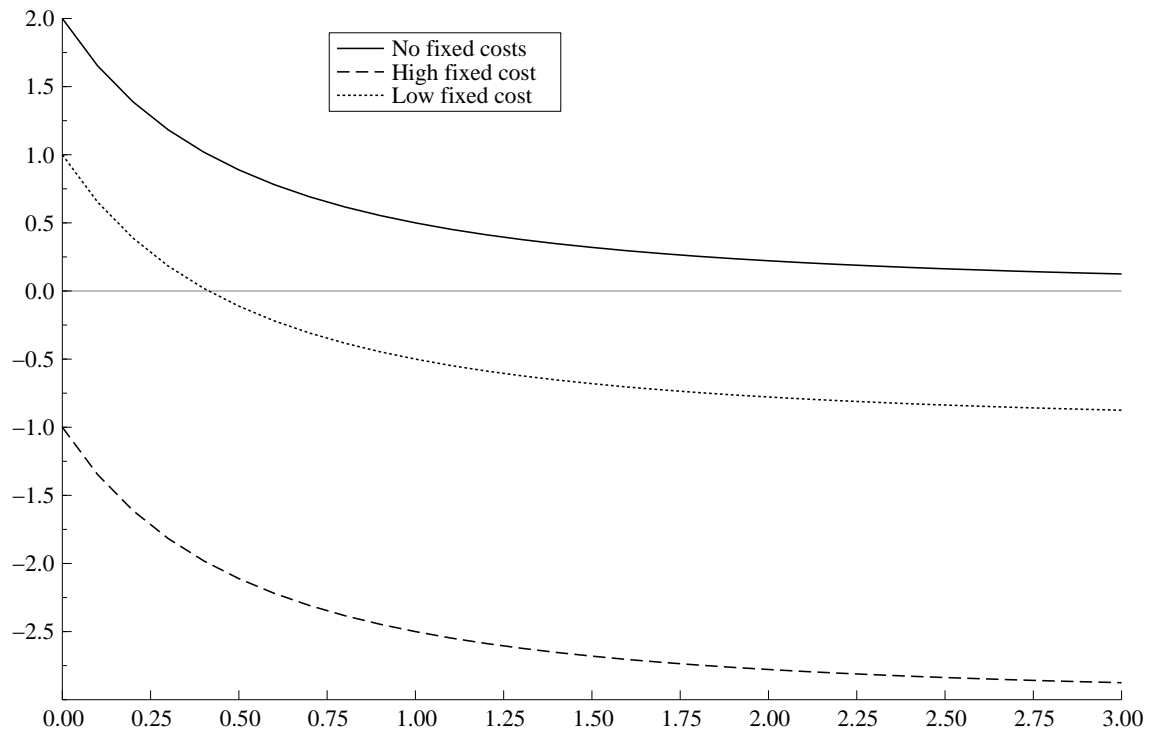
The conditional logit fixed effects panel estimation confirms the predictive power of preferential exports for exports to additional markets. In addition, the tight structure of the panel estimation pays off in that it reveals a differential impact of contemporaneous and lagged NAFTA tariff cuts, respectively, whose signs exactly conform to the predictions of a mechanism that works through preferential exports. Regarding the driving forces behind the geographic spread of trade in terms of product groups, the logit panel estimation attributes an important role to low technology goods with a low or intermediate degree of skill content. In the excess growth rate regressions though the trade-enhancing effect is strongest for sophisticated goods at the high end of skill

or technology content, while the low end is characterized by considerable tariff-induced trade diversion. It appears therefore that the stunning growth in the extensive margin as a count measure owes much to rather simple goods, while the impact of more sophisticated goods on the value of Mexican exports is not to be underestimated.

I close with a caveat concerning the theoretical underpinnings used in this study. Namely, the decision to export is modeled from a supply side perspective, assuming elastic demand. Thus, whenever demand side factors kick in, either for a given product or at a given point in time, the zero-profit condition that determines export participation becomes slack, yielding possibly inaccurate predictions for trade flows.

Tables and Figures

Figure 1: Profits and Efficiency



Notes: The solid curve shows, as a baseline, the 'no fixed cost' case, whereas incurring fixed costs shifts the profit schedule downwards (dashed line). As it is drawn no trade occurs in this (i, s) combination since not even the least cost supplier finds it profitable to export. The dotted line at last features some limited entry by more productive firms until profits turn negative. Shifting the profit curve even higher is associated with more firms exporting, i.e. a growth in the extensive margin at the firm level.

Figure 2: SKILL CONTENT OF MEXICAN EXPORTS, 1993/1997

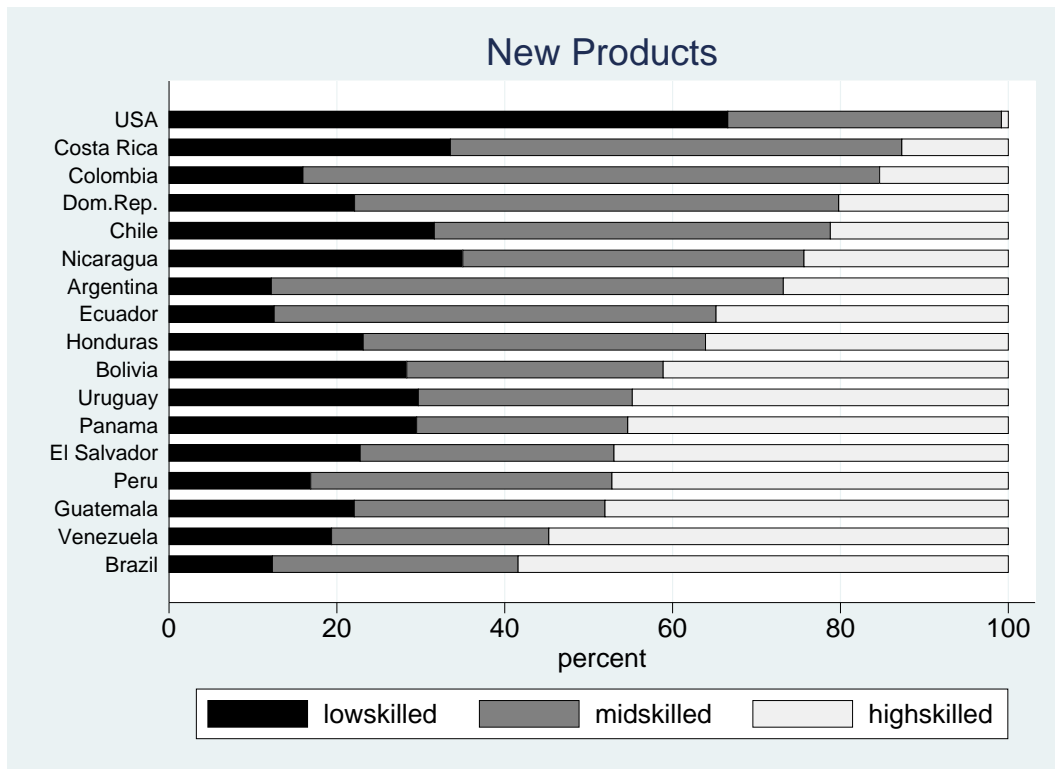


Table 1: EXTENSIVE MARGIN, LATIN AMERICA, 1993–1997

| Country | C_i | | N_i | | D_i | |
|-------------|-------|---------|-------|--------|-------|--------|
| | count | growth* | count | share* | count | share* |
| Argentina | 428 | 124.6 | 810 | 21.5 | 167 | 10 |
| Bolivia | 69 | 176.4 | 676 | 74.9 | 43 | 12.8 |
| Brazil | 346 | 335.3 | 791 | 39.9 | 151 | 25.7 |
| Chile | 570 | 457.5 | 1266 | 28.1 | 103 | 6.3 |
| Colombia | 646 | 231.4 | 1049 | 29.1 | 173 | 10.4 |
| Costa Rica | 752 | 292.5 | 1299 | 38 | 163 | 30.6 |
| Dom.Rep. | 189 | 162.3 | 826 | 16.4 | 75 | 5.9 |
| Ecuador | 295 | 177.4 | 774 | 45.4 | 118 | 22.1 |
| Guatemala | 1181 | 271.9 | 1307 | 28.5 | 200 | 9.5 |
| Honduras | 540 | 340.8 | 984 | 28.3 | 138 | 15.6 |
| Nicaragua | 263 | 191.2 | 829 | 59.2 | 76 | 12.8 |
| Panama | 465 | 212.1 | 1039 | 36.2 | 137 | 8.4 |
| Peru | 350 | 107.9 | 864 | 44.5 | 153 | 12.2 |
| El Salvador | 773 | 160.3 | 1035 | 26.9 | 157 | 7.2 |
| Uruguay | 149 | 126.3 | 472 | 32.9 | 112 | 22.5 |
| Venezuela | 622 | 344 | 1069 | 33.2 | 149 | 26 |
| USA | 3750 | 95.8 | 371 | .6 | 392 | .6 |

Notes:

Total number of HS-6 digit products: 4,995;

C_i – product i continuously traded in 1993 and 1997, aggregate growth over entire period;

N_i – product i newly traded in 1997 but not in 1993, value share of those products in 1997;

D_i – product i traded in 1993 but not in 1997, value share of those products in 1993;

* Figures are given as percentage of trade volume in that category.

Table 2: POOLED ESTIMATION BY SKILL/TECHNOLOGY CATEGORIES, LATIN AMERICA, 1997/93

| | Full Sample | | | Skill | | | Technology | | | |
|-------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | low | medium | high | low | medium | high | low | medium | high | res-based |
| Δ US Exports | 0.0268*** (0.003) | 0.0377*** (0.006) | 0.0384*** (0.006) | 0.0441*** (0.006) | 0.0389*** (0.006) | 0.0735*** (0.016) | 0.0441*** (0.006) | 0.0389*** (0.006) | 0.0735*** (0.016) | -0.0010 (0.003) |
| Δ RoW Exports | -0.9384*** (0.003) | -0.9335*** (0.005) | -0.9425*** (0.006) | -0.9363*** (0.006) | -0.9335*** (0.005) | -0.9301*** (0.012) | -0.9363*** (0.006) | -0.9510*** (0.006) | -0.9301*** (0.012) | -0.9288*** (0.004) |
| Δ US Mex. Tariff | 1.6738*** (0.403) | 11.9682*** (1.277) | 4.3909*** (1.051) | 5.4423*** (0.693) | 11.9682*** (1.277) | 7.5398** (3.280) | 5.4423*** (0.693) | 8.1733*** (0.879) | 7.5398** (3.280) | 1.8228*** (0.626) |
| Δ US MFN Tariff | -2.9858*** (0.387) | -3.2866*** (0.599) | -1.2048 (0.834) | -3.2123*** (1.118) | -3.2866*** (0.599) | 6.3094* (3.778) | -3.2123*** (1.118) | -7.6319*** (1.061) | 6.3094* (3.778) | -1.1869*** (0.413) |
| GDP p.c. | 0.0553 (0.042) | 0.0666 (0.078) | -0.0488 (0.091) | 0.1127 (0.089) | 0.0666 (0.078) | 0.1227 (0.176) | 0.1127 (0.089) | -0.0172 (0.087) | 0.1227 (0.176) | 0.0539 (0.054) |
| Population | 0.2176*** (0.026) | 0.4666*** (0.049) | 0.1976*** (0.055) | 0.0788 (0.053) | 0.4666*** (0.049) | 0.4350*** (0.109) | 0.0788 (0.053) | 0.3569*** (0.054) | 0.4350*** (0.109) | 0.1723*** (0.033) |
| Distance | -0.8680*** (0.058) | -1.1373*** (0.106) | -0.9215*** (0.130) | -0.7169*** (0.114) | -1.1373*** (0.106) | -1.0676*** (0.241) | -0.7169*** (0.114) | -1.1467*** (0.119) | -1.0676*** (0.241) | -0.7326*** (0.081) |
| R&D Expenditures | 0.0079 (0.005) | 0.0368*** (0.009) | 0.0059 (0.011) | -0.0134 (0.010) | 0.0368*** (0.009) | 0.0208 (0.021) | -0.0134 (0.010) | 0.0259** (0.011) | 0.0208 (0.021) | 0.0074 (0.006) |
| Constant | 4.2948*** (0.433) | 2.4453*** (0.800) | 5.7954*** (0.974) | 5.5524*** (0.852) | 2.4453*** (0.800) | 2.1969 (1.817) | 5.5524*** (0.852) | 4.9995*** (0.895) | 2.1969 (1.817) | 3.4629*** (0.604) |
| N | 73728 | 25728 | 15168 | 20048 | 25728 | 5520 | 20048 | 20400 | 5520 | 27760 |
| R^2 | 0.5353 | 0.4542 | 0.5944 | 0.4834 | 0.4542 | 0.4329 | 0.4834 | 0.5172 | 0.4329 | 0.6331 |

Notes:

Dependent variable is $\ln\left(\frac{X_{i,t}^c}{X_{i,t_0}^c}\right) - \ln\left(\frac{X_{i,t}^w}{X_{i,t_0}^w}\right)$, with $X_{i,t}^c$ denoting Mexican exports in product i at time t to country c , and $X_{i,t}^w$ worldwide Mexican exports excluding those to the US. Pooled estimation across 16 Latin American export destinations, country dummy variables not reported. "p.c.GDP" denotes per capita GDP in Purchasing Power Parity (PPP) units.

Table 3: POOLED ESTIMATION BY SKILL/TECHNOLOGY CATEGORIES, LATIN AMERICA, 2000/93

| | Full Sample | | | Skill | | | Technology | | | |
|-------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|--------|------|-----------|
| | low | medium | high | low | medium | high | low | medium | high | res-based |
| Δ US Exports | 0.0244*** (0.003) | 0.0506*** (0.005) | 0.0291*** (0.006) | 0.0151*** (0.005) | 0.0332*** (0.005) | 0.0523*** (0.014) | 0.0120*** (0.004) | | | |
| Δ RoW Exports | -0.8991*** (0.003) | -0.8896*** (0.005) | -0.8881*** (0.006) | -0.8893*** (0.005) | -0.9072*** (0.005) | -0.8892*** (0.011) | -0.8976*** (0.004) | | | |
| Δ US Mex. Tariff | 2.5095*** (0.307) | 6.5539*** (1.154) | 4.8335*** (1.136) | 5.4608*** (0.524) | 6.7028*** (0.590) | 1.0679 (3.630) | -0.0701 (0.626) | | | |
| Δ US MFN Tariff | -1.8215*** (0.433) | -1.9710*** (0.763) | 0.3400 (1.151) | 0.8577 (0.971) | -5.4722*** (1.141) | 1.2095 (2.906) | 0.0019 (0.543) | | | |
| GDP p.c. | 0.5412*** (0.048) | 0.7135*** (0.088) | 0.1415 (0.106) | 0.8429*** (0.098) | 0.5134*** (0.097) | 0.4838*** (0.178) | 0.3555*** (0.068) | | | |
| Population | -0.3396*** (0.052) | -0.3066*** (0.093) | -0.0669 (0.115) | -0.6924*** (0.102) | -0.3220*** (0.104) | 0.0964 (0.198) | -0.1847*** (0.075) | | | |
| Distance | -0.6570*** (0.065) | -0.5248*** (0.119) | -0.7031*** (0.143) | -0.8503*** (0.129) | -0.7356*** (0.130) | -0.8025*** (0.253) | -0.4311*** (0.096) | | | |
| R&D Expenditures | -0.0086** (0.004) | -0.0293*** (0.008) | -0.0094 (0.008) | 0.0129 (0.008) | -0.0181** (0.008) | -0.0337** (0.016) | -0.0122** (0.006) | | | |
| Constant | 7.3800*** (0.609) | 4.8746*** (1.127) | 6.5568*** (1.399) | 12.3899*** (1.219) | 8.2645*** (1.280) | 2.4607 (2.399) | 4.2557*** (0.833) | | | |
| N | 73904 | 25792 | 15184 | 20080 | 20448 | 5520 | 27856 | | | |
| R^2 | 0.5343 | 0.4535 | 0.5678 | 0.4875 | 0.5176 | 0.4424 | 0.6196 | | | |

Notes: See Table 2.

Table 4: EXTENSIVE MARGIN DECOMPOSITION, LATIN AMERICA, 1997/93

| | Export Growth | Ext. Margin | Int. Margin |
|-------------------------|-----------------------|------------------------|-----------------------|
| Δ US Exports | 2.2394*** (0.646) | 1.6816** (0.659) | 0.5578 (0.800) |
| Δ World Exports | -3.7637*** (0.709) | -2.5533** (1.077) | -1.2103 (1.062) |
| Δ US Mex. Tariff | -5.7162 (3.948) | -18.1270*** (5.161) | 12.4108** (4.700) |
| Δ US MFN Tariff | -4.7153 (9.057) | -20.9138*** (5.854) | 16.1985* (8.719) |
| GDP p.c. | -0.9320*** (0.010) | -0.7352*** (0.030) | -0.1968*** (0.024) |
| Population | 0.2469*** (0.006) | -0.1426*** (0.007) | 0.3895*** (0.007) |
| Distance | 0.2515*** (0.010) | 0.6713*** (0.012) | -0.4198*** (0.011) |
| R&D Expenditures | -0.0033*** (0.001) | -0.0011 (0.001) | -0.0022* (0.001) |
| Constant | 4.2823*** (0.161) | 4.6399*** (0.474) | -0.3575 (0.396) |
| N | 289 | 289 | 289 |
| R^2 | 0.1652 | 0.1634 | 0.1508 |

Notes:

Dependent variables: column (1) excess growth rate of exports at sectoral level, column (2) extensive margin, column (3) intensive margin. Due to that decomposition the coefficients in columns 2 and 3 sum up to the one in the first column. Pooled estimation over 16 Latin American countries, country fixed effects not reported.

Table 5: POOLED CONDITIONAL LOGIT ESTIMATION, LATIN AMERICA, 1997/93

| | Full Sample | GDP p.c. | | R&D | | Skill | | Technology | |
|-----------------------|-----------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|----------------------|----------------------|-----------------------|
| | | < Med | > Med | < Med | > Med | low | high | low | high |
| US exports | 0.0000*** (0.000) | 0.0000*** (0.000) | 0.0000 (0.000) | 0.0000*** (0.000) | 0.0000*** (0.000) | 0.0000** (0.000) | 0.0000** (0.000) | 0.0000*** (0.000) | 0.0000 (0.000) |
| US tariff MEX | 1.1818* (0.651) | 2.1686** (0.911) | 0.0106 (0.939) | 0.6183 (0.747) | 2.5948* (1.333) | 0.6183 (0.747) | 1.2841 (1.957) | 3.2883*** (1.118) | 1.4827 (5.431) |
| US tariff MFN | 0.5325 (0.546) | 0.4424 (0.788) | 0.5691 (0.761) | 0.5759 (0.630) | 0.5299 (1.111) | 0.5759 (0.630) | -0.4384 (1.088) | -0.0583 (1.087) | 11.4228*** (3.848) |
| US tariff MEX $t - 1$ | -1.5708*** (0.461) | -0.8985 (0.661) | -2.0311*** (0.646) | -1.0950** (0.539) | -2.7177*** (0.905) | -1.0950** (0.539) | -1.1471 (1.709) | -1.2125* (0.728) | 10.1867*** (2.984) |
| US tariff MFN $t - 1$ | 2.0048*** (0.684) | 1.4724 (0.946) | 2.7037*** (1.006) | 1.1514 (0.807) | 4.0535*** (1.316) | 1.1514 (0.807) | 3.8211*** (1.444) | 1.7840 (1.823) | -2.5154 (3.136) |
| N | 93024 | 44376 | 48648 | 65890 | 27134 | 65890 | 16367 | 31112 | 8248 |
| pseudo R^2 | 0.0957 | 0.0961 | 0.0961 | 0.0855 | 0.1241 | 0.0855 | 0.0804 | 0.1395 | 0.0594 |
| $\log \mathcal{L}$ | -31632.0 | -15047.6 | -16571.1 | -22673.9 | -8923.2 | -22673.9 | -5661.5 | -10109.0 | -2924.3 |

Notes:

Dependent variable is binary indicator variable on export status. Column 1 estimates refer to entire sample while subsequent models split the sample between country below/above the median per capita GDP and median R&D expenditures, respectively. The last two models split the sample along the products' skill and technology content, respectively. Pooled estimation over 16 Latin American countries, country fixed effects included but not reported.

Table 6: LONG DIFFERENCE IN EXPORTS, LATIN AMERICA, 1997/93

| | Argentina | | Bolivia | | Brazil | | Chile | |
|----------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | (1) | (2) | (1) | (2) | (1) | (2) | (1) | (2) |
| Δ US Exports | 0.0410*** (0.010) | 0.0102 (0.014) | 0.0119* (0.007) | 0.0163 (0.012) | 0.0346*** (0.010) | 0.0283** (0.014) | 0.0398*** (0.014) | 0.0677*** (0.025) |
| Δ RoW Exports | -0.9413*** (0.010) | -0.9404*** (0.010) | -1.0105*** (0.006) | -1.0104*** (0.006) | -0.9572*** (0.010) | -0.9560*** (0.010) | -0.8847*** (0.014) | -0.8844*** (0.014) |
| Δ US Mex. Tariff | 12.4669*** (1.541) | 12.2682*** (1.539) | 1.9482* (1.179) | 2.0322* (1.178) | 6.1031*** (1.537) | 6.0969*** (1.536) | -6.7946*** (2.012) | -6.5117*** (2.020) |
| Δ US MFN Tariff | -6.3311*** (1.678) | -6.2950*** (1.666) | -2.0840* (1.118) | -2.0947* (1.116) | -2.7487** (1.302) | -2.7541** (1.302) | 0.2376 (2.105) | 0.1875 (2.087) |
| Slope US Exp: mid-skilled | | 0.0784*** (0.029) | | -0.0036 (0.018) | | 0.0497* (0.030) | | -0.0343 (0.038) |
| Slope US Exp: high-skilled | | 0.0490* (0.026) | | 0.0073 (0.017) | | 0.0084 (0.024) | | -0.0258 (0.036) |
| Constant | 1.1955*** (0.072) | 1.1946*** (0.073) | 1.0941*** (0.053) | 1.0964*** (0.053) | 1.2874*** (0.075) | 1.2831*** (0.075) | 2.0178*** (0.079) | 2.0185*** (0.080) |
| N | 4608 | 4608 | 4608 | 4608 | 4608 | 4608 | 4608 | 4608 |
| R^2 | 0.5415 | 0.5422 | 0.7029 | 0.7031 | 0.5239 | 0.5245 | 0.4290 | 0.4295 |

Table 6: (continued)

| | Colombia | | Costa Rica | | Dominican Republic | | Ecuador | |
|----------------------------|-----------------------|-----------------------|------------------------|------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | (1) | (2) | (1) | (2) | (1) | (2) | (1) | (2) |
| Δ US Exports | 0.0206* (0.012) | 0.0163 (0.019) | 0.0222 (0.014) | 0.0284 (0.021) | 0.0047 (0.008) | 0.0030 (0.012) | 0.0132 (0.010) | 0.0084 (0.013) |
| Δ RoW Exports | -0.8880*** (0.013) | -0.8875*** (0.013) | -0.8922*** (0.013) | -0.8924*** (0.013) | -0.9946*** (0.008) | -0.9938*** (0.008) | -0.9581*** (0.009) | -0.9570*** (0.009) |
| Δ US Mex. Tariff | -0.5584 (1.892) | -0.4835 (1.901) | -11.2002*** (1.919) | -11.0120*** (1.927) | 6.9236*** (1.410) | 6.9349*** (1.409) | 8.9286*** (1.164) | 8.8862*** (1.165) |
| Δ US MFN Tariff | -3.7921** (1.583) | -3.7962** (1.585) | -0.3028 (1.920) | -0.3168 (1.919) | -2.8652* (1.478) | -2.8733* (1.478) | -2.6272** (1.238) | -2.6325** (1.242) |
| Slope US Exp: mid-skilled | | 0.0219 (0.035) | | -0.0195 (0.034) | | 0.0324 (0.022) | | 0.0476* (0.027) |
| Slope US Exp: high-skilled | | 0.0346 (0.031) | | 0.0376 (0.035) | | -0.0002 (0.020) | | -0.0090 (0.024) |
| Constant | 1.4945*** (0.079) | 1.4990*** (0.079) | 1.8030*** (0.079) | 1.8137*** (0.080) | 1.4540*** (0.065) | 1.4502*** (0.065) | 1.2297*** (0.064) | 1.2221*** (0.064) |
| N | 4608 | 4608 | 4608 | 4608 | 4608 | 4608 | 4608 | 4608 |
| R^2 | 0.4493 | 0.4501 | 0.4465 | 0.4475 | 0.6122 | 0.6126 | 0.5974 | 0.5978 |

Table 6: (continued)

| | Guatemala | | Honduras | | Nicaragua | | Panama | |
|----------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | (1) | (2) | (1) | (2) | (1) | (2) | (1) | (2) |
| Δ US Exports | 0.0412*** (0.015) | 0.0354 (0.024) | 0.0344*** (0.011) | 0.0318* (0.018) | 0.0114 (0.008) | 0.0080 (0.014) | 0.0427*** (0.011) | 0.0404** (0.017) |
| Δ RoW Exports | -0.8174*** (0.014) | -0.8168*** (0.014) | -0.9541*** (0.010) | -0.9537*** (0.010) | -0.9944*** (0.008) | -0.9940*** (0.008) | -0.9572*** (0.011) | -0.9562*** (0.011) |
| Δ US Mex. Tariff | 2.1703 (1.910) | 2.1933 (1.921) | -0.9892 (1.597) | -0.9411 (1.601) | 2.9919** (1.280) | 3.0115** (1.282) | 0.2662 (1.807) | 0.2515 (1.810) |
| Δ US MFN Tariff | -3.0753 (2.087) | -3.0754 (2.072) | -2.0804 (1.772) | -2.0830 (1.773) | -3.4853*** (1.206) | -3.4877*** (1.204) | -4.1253*** (1.468) | -4.1334*** (1.466) |
| Slope US Exp: mid-skilled | | 0.0263 (0.037) | | 0.0136 (0.028) | | 0.0213 (0.021) | | 0.0391 (0.029) |
| Slope US Exp: high-skilled | | 0.0240 (0.041) | | 0.0220 (0.028) | | 0.0137 (0.020) | | -0.0082 (0.028) |
| Constant | 1.8557*** (0.079) | 1.8574*** (0.079) | 1.4022*** (0.068) | 1.4051*** (0.068) | 1.3654*** (0.061) | 1.3657*** (0.061) | 1.5605*** (0.071) | 1.5542*** (0.071) |
| N | 4608 | 4608 | 4608 | 4608 | 4608 | 4608 | 4608 | 4608 |
| R^2 | 0.4018 | 0.4023 | 0.5607 | 0.5611 | 0.6380 | 0.6383 | 0.5281 | 0.5284 |

Table 6: (continued)

| | Peru | | El Salvador | | Uruguay | | Venezuela | |
|----------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | (1) | (2) | (1) | (2) | (1) | (2) | (1) | (2) |
| Δ US Exports | 0.0229** (0.010) | 0.0056 (0.013) | 0.0332*** (0.012) | 0.0304 (0.019) | 0.0293*** (0.007) | 0.0433*** (0.012) | 0.0258* (0.013) | 0.0083 (0.021) |
| Δ RoW Exports | -0.9544*** (0.010) | -0.9532*** (0.010) | -0.9294*** (0.011) | -0.9292*** (0.011) | -0.9875*** (0.007) | -0.9870*** (0.007) | -0.8935*** (0.013) | -0.8928*** (0.013) |
| Δ US Mex. Tariff | 6.9179*** (1.447) | 6.7753*** (1.450) | -1.7808 (1.685) | -1.7146 (1.686) | -2.1555* (1.228) | -2.0686* (1.223) | 1.5435 (1.740) | 1.4998 (1.745) |
| Δ US MFN Tariff | -2.5066 (1.651) | -2.4935 (1.656) | -4.7872*** (1.616) | -4.7891*** (1.623) | -2.4429** (1.135) | -2.4703** (1.132) | -4.7569** (1.901) | -4.7431** (1.907) |
| Slope US Exp: mid-skilled | | 0.0715** (0.029) | | 0.0091 (0.031) | | -0.0010 (0.021) | | 0.0538 (0.036) |
| Slope US Exp: high-skilled | | 0.0079 (0.026) | | 0.0299 (0.033) | | -0.0358** (0.016) | | 0.0461 (0.034) |
| Constant | 1.3055*** (0.071) | 1.2978*** (0.072) | 1.5094*** (0.071) | 1.5145*** (0.071) | 0.5237*** (0.054) | 0.5174*** (0.054) | 1.6015*** (0.079) | 1.6038*** (0.080) |
| N | 4608 | 4608 | 4608 | 4608 | 4608 | 4608 | 4608 | 4608 |
| R^2 | 0.5458 | 0.5463 | 0.5125 | 0.5129 | 0.6995 | 0.6997 | 0.4534 | 0.4543 |

Notes:

Dependent variable is $\ln\left(\frac{X_{i,t+1}^c}{X_{i,t+0}^c}\right) - \ln\left(\frac{X_{i,t+1}^W}{X_{i,t+0}^W}\right)$, with $X_{i,t}^c$ denoting Mexican exports in product i at time t to 16 alternate Latin American countries c , and $X_{i,t}^W$ worldwide Mexican exports excluding those to the US.

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