Do Tariffs Matter for the Extensive Margin of International Trade? An Empirical Analysis

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Explaining the strong growth of world trade with the relatively moderate tariff reductions since World War II is a quantitative challenge. It has been conjectured that the trade of new goods resulting from tariff reductions might be the missing link. We investigate this hypothesis with the Eaton and Kortum (2002) model using disaggregate trade and tariff data for U.S. bilateral imports between 1989 and 1999. We find that changing tariffs influence the extensive margin of countries' exports to the United States in a statistically significant way such that U.S. tariff reductions give way to new goods being traded. However, our estimates show that country and industry specific factors are far more important than U.S. tariffs in explaining why countries start trading new goods and stop trading others. Our estimates also indicate that tariff reductions in the exporting countries between 1989 and 1999 were more important in increasing the extensive margin than U.S. tariff reductions were.

1. Introduction

Sustained growth of international trade has characterized the world economy since World War II. Explaining the steady increase in the volume of international transactions, however, presents a major quantitative challenge. While continued trade liberalizations have often been credited for increasing trade, overall, tariff reductions have been relatively moderate.[2] Consequently, the elasticity of exports to tariffs that is necessary to match tariff reductions and aggregate trade expansion, it has been argued, is larger than what our models suggest. In this lively debate, a new hypothesis has attracted considerable attention. Researchers have focused on the changing range of goods that countries trade, and have observed non-negligible increases in this extensive margin of trade after trade liberalizations. It is conjectured that these increases are behind the

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magnified impact of tariff reductions. In this paper, we investigate with disaggregate trade and tariff data, the link between tariffs and the changing extensive margin.

We study disaggregate bilateral exports to the United States between 1989 and 1999. We confirm that U.S. tariff reductions increase the range of goods that countries export to the United States. Yet, the size of their contribution is relatively small. Because the scope of any trade liberalization is broader than just tariff reductions, our results should not necessarily be interpreted as saying that trade liberalizations as such do not matter for the extensive margin. Nevertheless, these findings do suggest that other factors, such as changing macroeconomic conditions in the exporting countries or technological innovations, are quite important in explaining much of the observed changes in the extensive margin. We also uncover a role for trade liberalizations undergone in the exporting countries, which is quantitatively non-trivial and indicative of international production fragmentation.

In recent years, empirical research has uncovered the extensive margin as a new frontier for international trade. From the research by Helpman, Melitz, and Rubinstein (2004), Hummels and Klenow (2005), Evenett and Venables (2002), Besedes and Prusa (2003), Kang (2004), and Felbemayr and Kohler (2006), we know that countries differ in the variety of goods that they trade and also in the range of countries with which they trade.[3] Moreover, the sets of countries, goods, or sectors change over time and vary more than traditional models would indicate.[4] Needless to say, this growing attention for the extensive margin is closely linked to the recent focus on firm heterogeneity both in theoretical and empirical work.[5] An important challenge in this emerging literature is to tie the expansion of the extensive margin to trade liberalizations. Yi (2003) was one of the first to do so, as he pointed out that the changing extensive margin could help explain

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[2] As Yi (2003) notes, since the early 1960s average tariff on manufacturing goods have dropped worldwide by 11 percent, yet the share of manufacturing exports in GDP has risen by a factor of 3.4.

[3] For how changing sets of goods that countries trade affect price and quantity indices and what these imply for economic welfare, see Feenstra (1994) and Broda and Weinstein (1994). The effects of tariffs on the intensive margin have been studied by Romalis (2005) and others.

[4] The extensive margin is defined in various ways in the above studies. Helpman, et al. (2004) and Felbemayr and Kohler (2006), for example, link their analysis to the gravity equation and study the extensive margin at a very aggregate level, i.e. the extent to which countries trade with new countries. Our approach is more closely linked to Hummels and Klenow (2005), who study at a disaggregate level the extent to which a country exports goods not previously exported.

[5] See Helpman, Melitz, and Rubinstein (2004).

the quantitative puzzle of why aggregate trade responds so strongly to moderate tariff reductions.

Yi (2003) has argued, and provided some evidence, that increases in the extensive margin are linked with vertical specialization in the wake of tariff reductions. What used to be trade in final goods often becomes, after a tariff reduction, an internationally fragmented production process in which a product crosses borders multiple times at different stages of its making. This phenomenon that changes the nature of international transactions may be, in Yi's view, an explanation for the pronounced post-WWII trade expansion when tariff reductions have been relatively moderate.[6] Ruhl (2005) and Kehoe and Ruhl (2002) have made similar claims in a somewhat different setting. Ruhl (2005) shows how permanent tariff reductions, as opposed to temporary business cycle shocks, affect firms' decisions to export. In this respect, tariff reductions increase the extensive margin as new firms enter the export markets. In a calibrated model, Ruhl (2005) shows how the failure to account for these new goods produces large aggregate elasticities of exports to tariffs. Kehoe and Ruhl (2002), as of now, have probably provided the most detailed analysis of this changing extensive margin in the wake of trade liberalizations on a bilateral basis.[7] They study trade liberalizations in 18 countries and show how substantial increases in the extensive margin coincide with trade liberalizations.

Our paper focuses specifically on the relation between tariffs and tariff reductions on the one hand, and the extensive margin on the other hand. We take as a benchmark the probabilistic Ricardian model developed by Eaton and Kortum (2002). The Ricardian model attributes international trade to technological differences between countries. Dornbusch, Fischer, Samuelson (1977) study a two-country Ricardian model with a continuum of goods. Eaton and Kortum's (2002) probabilistic formulation then extends the Dornbusch, Fischer, Samuelson (1977) model in a very elegant way to multiple

[6] To be precise, Yi (2003) refers to trading parts that were not traded before as the "external margin." Since this type of trade involves goods not traded before, in our terminology, it amounts to a change in the extensive margin. Note that Yi's explanation of the extraordinary growth of post-WWII trade and how it relates to trade policy is not limited to the extensive margin. He also considers changes along the intensive margin, which he terms internal margin. In particular, a global reduction in tariffs leads to a magnified reduction in the cost of producing and a consequently to an extra strong increase in trade of goods that already crossed borders multiple times before the tariff reduction.

[7] See also Hilberry and McDaniel (2002).

countries.[8] Like Melitz (2002), Eaton and Kortum (2002) is a canonical paper on firm heterogeneity. So far, Melitz (2002) has been especially successful in inspiring empirical work.[9] In this paper, we apply the Eaton and Kortum (2002) model to investigate the link between trade policy and the extensive margin. In their paper, Eaton and Kortum (2002) derive an equation that lays out the factors that determine the probability that a good is exported by a particular country, which reduces to a conditional logit model.[10] However, because even with the highly disaggregate trade and tariff data that we use, goods are rarely ever exported by exactly one country, we estimate a conditional logit that relaxes Eaton and Kortum's requirement of perfect specialization. We complement our findings with fixed-effect probits and also instrument for tariff policy to address concerns in the endogenous protection literature that endogeneity may understate the true effect of tariff reductions, as Trefler (1993) argues. Finally, we compare the implied change in the extensive margin between 1989 and 1999 that can be attributed to tariff changes with the actual change in the extensive margin that is found in the data.

We find compelling evidence that tariffs do indeed affect the range of goods that countries export.[11] However, from a quantitative point of view, we find that U.S. tariffs play a minor role in explaining the large changes of the range of goods that countries export that are seen in the data. Most telling in this respect is Figure 1a. Figure 1a plots the number of newly traded goods categories in total trade as it is found in the data against the predicted newly traded goods that our model attributes to U.S. tariff reductions. If tariffs would explain 100 percent of the action at the extensive margin, we should obtain a scatter plot along the 45-degree line. As is clear from the graph, this is not at all the case. All else equal, we find that U.S. tariff reductions can account for 6.7

[8] Wilson (1980) also extends the Ricardian model to multiple countries. He lays out the necessary conditions to analyze the change in trade patterns on the extensive margin among a finite number of countries.

[9] See, for example, Helpman, Melitz and Yeaple (2004) with its extension toward multinational corporations.

[10] In footnote 18, Eaton and Kortum (2002) emphasize the link between their model and discrete choice models.

[11] Our findings are corroborated by Feenstra and Kee (2004) and an earlier working paper by Klenow and Rodriguez-Clare (1997). Feenstra and Kee (2004) focus on the nexus between the number of varieties and country productivity in a model inspired by Meltiz (2002). They use tariffs to instrument for productivity. Klenow and Rodriguez-Clare (1997) study the welfare impact of increasing varieties after a trade liberalization for Puerto Rico and, under relatively strong assumptions, relate tariffs to an index of the number of varieties.

percent of the new goods that emerged between 1989 and 1999. Driving these results are relatively small marginal effects (a 1 percent point drop in the U.S. tariff increases the probability that a good will be exported by approximately 0.0032 percentage points) in conjunction with the overall moderate size of the tariff reductions in the United States over this period. While our findings in no way diminish the contribution of the extensive margin to the growth of trade, they do suggest that factors other than U.S. tariffs account for the major share of why goods are newly traded. These factors are macroeconomic conditions, technological innovations, as well as other relevant features of formal trade agreements that are captured by country-specific variables and goods effects. We also find that even though the marginal effect of tariff liberalizations in exporting countries is comparatively small, these liberalizations have played a more important role between 1989 and 1999 in stimulating export growth along the extensive margin. This is especially true for developing countries, which underwent sizeable liberalizations, a finding that further supports recent findings of the importance of vertical specialization in current trade patterns.[12] A few stylized facts about the changing extensive margin of U.S. trade illustrate our conclusions clearly.

The period that we study roughly coincides with the years before and after the NAFTA agreement, the major, though not exclusive, trade liberalization for the U.S. over the sample period. Studied in isolation, it is quite suggestive that the NAFTA countries indeed experience significant increases in the extensive margin of exports to the U.S. between the beginning and the end of our sample. However, Canada and Mexico are clearly not the only countries that experienced substantial growth in the range of goods exported to the United States. For around 85 percent of the exporting countries in our sample, over 40 percent of all goods categories that these countries exported to the United States in 1999 were not exported in 1989. Similarly, for 40 percent of the countries sampled, more than 40 percent of the total value of exports to the United States

[12] Feenstra (1998), Hummels, Rapoport, and Yi (1998), and Hummels, Ishii, and Yi (2001) have documented the growing importance of vertical production networks and their contribution to trade growth over the past several decades. In this paper, we find that exporting countries' tariffs significantly decreases the range of goods a country is likely to export, which is consistent with a role for vertical specialization in the sense that exporting country tariffs may raise the prices of intermediate goods more efficiently produced abroad. Specifically linking a measure of bilateral vertical specialization to both importing and exporting country tariffs, Mostashari (2007) finds support that exporting country liberalizations have been quantitatively important in stimulating the growth of vertical production networks.

is in goods that were not exported at the beginning of the sample. At the same time, we find a significant overlap between the specific categories of goods in which the exports of a NAFTA country, such as Mexico, increase along the extensive margin and the goods that other countries, which did not experience comparably large tariff reductions, also begin to export to the United States. Moreover, the universal growth in the range of goods that countries exported to the United States over this period suggests that tariff liberalizations cannot be the alfa and omega in trying to explain the growth of the extensive margin.

The remainder of this paper is organized as follows. Section 2 discusses the data and presents summary statistics. Section 3 provides the main theory regarding the role of tariffs on the extensive margin. Section 4 discusses the empirical model used to estimate the effect of tariffs on the extensive margin. Section 5 contains the empirical results. Section 6 is the conclusion.

2. Data and Descriptive Statistics

2.1 Data

We study the period 1989–1999. Data on U.S. imports are taken from the NBER's database for *Harmonized System Imports, Commodity by Country*, which defines goods at the Harmonized System 10-digit (HTS 10) level. We focus on manufacturing goods and especially on all categories whose classifications were continuously used throughout the period and did not undergo any sort of reclassification. To be consistent with our econometric analysis, we present the data at the HTS 6-digit level for which we have 3,662 manufacturing commodities.[13] As a measure of the value of imports in a given year, we use the reported customs value of imports for consumption, which measures the total of merchandise that has physically cleared through customs either entering consumption channels immediately or entering after withdrawal from bonded warehouses.

In the descriptive statistics that follow, we include all countries for which the U.S. did not have a trade embargo or extensive sanctions over the sample period. However,

between the years 1989 and 1999, several countries were restructured. These countries correspond to those that were formally part of the USSR, Yugoslavia, Czechoslovakia, as well as North and South Yemen, and East and West Germany. In order to look at the changes in the range of goods exported by those countries that were restructured, we aggregate trade volumes for these countries. Table A1 lists the countries which were aggregated into specific economic regions. After this aggregation, we are left with 144 countries/regions that are listed in Table A2.

Our tariff data are taken from the NBER's *U.S. Tariffs* database. The database includes the *ad valorem*, specific, and estimated *ad valorem* equivalent tariffs based on the most-favored nation (MFN) status. In addition, the file also indicates commodities that are eligible for tariff preference programs and the applicable tariffs under these programs. As a measure for trade barriers, we use the estimated *ad valorem* equivalent tariff for a particular country applicable under the relevant preference program. If a country/good qualifies for more than one preference program, we use the minimum tariff of all qualifying programs.

In our descriptive statistics and econometric analysis, we make use of several country-specific variables taken from the *Penn World Tables 6.2, World Development Indicators,* and the *World Bank's Trade and Production Database*. Because we do not have a complete panel for the restructured countries and a few other countries that are not included in one or more of these sources, econometric estimates and statistics which involve these data are limited to a smaller sample of countries.[14] The set of countries included in the final econometric specification are listed in Table A3.

2.2 Evolution of U.S. Tariffs 1989–1999

Over our sample period, U.S. tariff variation for a given good across countries can be attributed to several preferential arrangements and bilateral free trade agreements (FTA). The United States–Israel FTA took effect 1985 and provided for the elimination

[13] To ensure compatibility between the 6-digit tariff and trade data we estimate the model at the 6-digit level. Earlier versions of the paper provide the data/estimates at the 10-digit level. There are no major differences in our findings.

[14] We, however, do keep Germany/East Germany and use the West German country-level data for 1989.

of duties for merchandise from Israel entering the United States.[15] While the Canada–U.S. Free Trade Agreement (CUSFTA), entered into force in 1989, it was supplanted by the North American Free Trade Agreement (NAFTA) in 1994. In addition to those, the U.S. had two other regional preferential agreements during the sample period. The Caribbean Basin Initiative (CBI), which was in force throughout our sample period, offered preferential and sometimes duty-free treatment for a range of products to qualifying nations and territories. The Andean Trade Promotion Act (ATPA), which entered into force in 1993, applied to qualified goods exported by Bolivia, Columbia, Ecuador, and Peru. In addition, the United States offered duty-free treatment for a range of goods to qualifying less-developed countries under the Generalized System of Preferences (GSP); furthermore, a wider range of goods are offered duty-free treatment to the least developed of these countries (GSPLDC).[16] For other countries granted normal trade relations (NTR) status, the U.S. charges the MFN rate. However, a few countries were either at some point or continuously subjected to the much higher so-called column-2 tariff rates. We refer to these countries as column-2 (COL2) countries.[17]

In order to study the changes in U.S. tariffs between 1989 and 1999, we look at the changes in tariffs for countries or groups of countries based on the relevant preference program. Figure 2a plots the evolution of average tariffs across manufacturing goods separately for Canada, Mexico, Israel, and the country groups qualifying for CBI, ATPA, GSP, or GSPLDC preferential treatment. Because of the difference in scale, for the select number of countries that were subjected to column-2 tariffs, average manufacturing tariffs are plotted in a separate chart, Figure 2b.

As can be seen in Figure 2a, of the countries receiving some preferential treatment, the most pronounced decreases occur for Canada and Mexico, which decrease by approximately 4.7 percent and 3.1 percent respectively. Average tariff rates for GSPLDC countries and those countries qualifying for MFN status decrease by around 1.2

[15] As of January 1, 1995, all eligible reduced rate imports from Israel were accorded duty-free treatment. However, the FTA does allow the two countries to protect sensitive agricultural subsectors with nontariff barriers including import bans, quotas, and fees.

[16] Countries/regions that qualified for CBI and ATPA preferences are indicated in Table A2. Because the set of countries qualifying for GSP and GSPLDC preferences was year specific, we refer readers to the NBER's *U.S. tariffs* database for a list of the qualifying countries for a given year.

percent. Since all the ATPA countries qualified for GSP status for years prior to 1993, their decrease is about 1.3 percent. While Israel and GSP countries experienced a decrease on average of 0.5 percent, CBI beneficiaries experienced practically no change in tariffs. For countries subject to COL2 tariffs both at the beginning and end of the sample, average tariffs actually increased. Of all countries/regions, the largest decreases in tariffs occurred for the countries that switched from being a COL2 country to qualifying for GSP status.[18] For these countries, average manufacturing tariffs decreased by around 25 percentage points between 1989 and 1999. While these tariffs are useful in summarizing average trends, they mask a significant amount of variation across goods. Figure 3 summarizes the ranges of tariffs for all goods across the different tariff programs.

Moreover, the largest changes in tariffs occur for those countries that gained preference status by 1999 and the NAFTA countries. The rapid increase of Mexico's and Canada's trade with the United States in the wake of NAFTA has been well documented by Romalis (2005) and others. In addition, Kehoe and Ruhl (2002) and Hilberry and McDaniel (2002) have emphasized the importance of changes in the extensive margin of trade after NAFTA and other trade liberalizations. Less effort, however, has gone into comparing countries that have benefited from trade liberalizations to those that have not, and specifically into assessing across the board the extent to which countries export goods (to the United States) that they did not previously trade. To this end, in what follows we focus on comparing the importance of newly traded goods by countries that experienced substantial decreases in U. S. tariffs to that of other U.S. trading partners that for the most part did not experience the same sweeping tariff reductions.

2.3 Newly traded goods across countries

Because we study changes in the extensive margin, we compare trade patterns occurring in 1989 to those that occur in 1999. For simplicity, a commodity is considered

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[17] Of our sampled countries, those that were subject to COL2 tariffs for at least part of the sample were Albania, Bulgaria, East Germany, Laos, Mongolia, Romania, and countries formerly part of the U.S.S.R., Yugoslavia, and Czechoslovakia (see Table A1).

[18] For our sampled countries, only one country, Laos, was subjected to the COL2 tariffs throughout the sample. Countries/Regions which were subjected to higher tariffs at the beginning but which by 1999

traded in a particular year if there are positive exports to the United States.[19] If extensive margin growth is the result of trade liberalization, one would expect to find the most pronounced increases along the extensive margin to correspond to those countries that experienced larger decreases in U.S. tariffs. Indeed, the share of newly traded goods in 1999 (goods that were exported in 1999, but not in 1989) is quite large for those countries that experienced large decreases in U.S. tariffs. However, for many other countries whose tariffs did not decrease dramatically, one finds comparably large shares of newly traded goods. Table 1 clearly confirms that point. Looking at the countries/regions that switched from having no preference to qualifying for GSP status, experiencing a 25 percent decrease in average tariffs, one finds newly traded goods comprise very large shares of traded goods, ranging from 59 percent to 94 percent. One also finds large shares for Mexico. Mexico exports 2,819 of the 3,662 goods categories in either 1989 or 1999 or both. Yet, 35 percent of those goods were newly traded post-NAFTA. These percentages are fairly high, and at least suggest that the set of goods that a country trades changes significantly over time and thus may well be related to tariff decreases. The share of newly traded goods for Canada is less at 8 percent. This is not surprising, since Hummels and Klenow (2002) have shown that the range of goods exported is larger for bigger and more developed countries. Moreover, given the finite number of goods, the extensive margin *growth* is more manifest for less developed countries.

Similarly, a look at the rest of the sampled countries, which did not experience comparably large reductions in U.S. tariffs, further casts skepticism on attributing all extensive margin growth to tariff reductions. For example, China exports 2,773 of all goods categories at some point in time, and 34 percent of these traded goods are newly traded. We also analyze the percent of newly traded goods for the rest of the world as a whole. Treating each of the rest of the countries' goods as a separate observation, we see that 30 percent of the goods were not traded in 1989. Figures 4a and 4b plot the share

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qualified for GSP preferences were countries formerly part of the USSR, Yugoslavia, and Czechoslovakia (see Table A1), Bulgaria, Mongolia, and Romania.

[19] As a robustness check, we performed all estimations on alternative criteria for a good to be traded. For example, we considered a good to be traded at the beginning/end of the sample if it was traded in at least one of the three years, 2 of the 3 years, and all of the years 1989-1991/1997-1999. However, neither the descriptive statistics nor the econometric estimates systematically changed under these alternative criteria.

(respectively in terms of the number of HTS 6 categories and the value of trade) of goods newly traded in 1999 against average changes in tariffs. Both figures show that extensive margin growth of exports to the United States was not at all limited to countries experiencing systematic U.S. tariff liberalizations. Furthermore, for a given tariff reduction, the importance of newly traded goods in traded goods varies substantially across countries.

Figures 5a and 5b illustrate how important newly traded goods are for all the countries in our data set. In terms of the categories of goods traded, Figure 5a shows that newly traded goods constitute over 40 percent of all the goods categories in which a country trades, for over 80 percent of the sampled countries. As seen in Figure 5b, in terms of the total value of a country's 1999 exports, newly traded goods constitute over 40 percent of the value of exports for over 40 percent of the countries in our dataset. Figures 6a and 6b confer the same message. These charts plot the share of newly traded goods (respectively in terms of the number of HTS 6 categories and the value of trade) against the exporting country's real 1996 per-capita GDP. What is clear is that none of the countries whose tariffs decreased more compared to the other countries over the sample period stand out as outliers.

2.4 Overlap of newly exported goods between NAFTA and non-NAFTA countries

Table 2 is meant to directly relate the goods that Mexico only started exporting after NAFTA to the goods that the rest of the world exported to the United States at the end of our sample. In the first row, we read that Mexico exported 771 goods in 1999 that were not exported in 1989. Treating each country's goods as a separate observation, the three columns in the second row categorize instances where these same goods were newly traded, continuously traded, or stopped being traded in the 142 non-NAFTA countries in our sample. One notices that 38 percent of these instances correspond to newly traded goods for the non-NAFTA countries. In 17 percent of these cases, Mexico's newly traded goods coincide with countries from the rest of the world stopping their export to the United States. For the remaining 45 percent of the cases, Mexico's newly traded goods were and continue to be exported by the rest of the world. The remaining

rows summarize the other categories of Mexican exports: the goods that disappear and the ones that are continuously traded.

As indicated before, the non-NAFTA countries experienced some degree of multilateral and/or bilateral tariff reductions for their exports to the United States, but these were, in most instances, not comparable to the decreases that were experienced by Mexico and Canada.[20] Still, there is a lot of extensive margin growth across the board in the rest of the world. Table 2 reinforces the observations of Table 1 that trade liberalizations cannot be the alfa and omega for why countries trade goods at the end of sample that they did not trade at the beginning. For the particular goods that are newly exported by Mexico in 1999, there are a great many countries that export exactly in the same goods categories for the first time.

3. Theoretical Setup

The classic international trade model by Ricardo is one of the first to identify technological differences between countries as a source of comparative advantage. The Ricardian model can rationalize a world of complete specialization of production in which different countries produce different sets of goods. Dornbusch, Fischer, and Samuelson's (1977) (hereafter, DFS) generalize the original two-country, two-goods model by Ricardo to a continuum of goods. The DFS extension lends itself well to the analysis of the extensive margin**.** In the DFS world, consumers spend a fixed fraction of their income on separate goods. Moreover, one can order the continuum of goods according to the relative efficiency of the countries, such that relative wages and tariffs determine the ranges of goods that are produced domestically, produced abroad, and not traded. Trade liberalizations then alter the pattern of specialization between both countries, and hence previously non-traded goods may become traded. In other words, tariff changes affect the extensive margin of countries' trade.

Eaton and Kortum (2002), like Wilson (1980) before them, extend the DFS model to a multicountry setting. Employing a probabilistic model of technological heterogeneity, Eaton and Kortum (2002) derive an equation that explains the probability

[20] As indicated, notable exceptions are countries that previously belonged to the Communist Block, some of which during the sample period became eligible for preferential (GSP) status.

that a country supplies a specific good to another country with country-specific differences in technology, factor costs, and geographic barriers. We add goods-specific factors, such as tariffs, to this cost structure in order to study the influence of tariffs on changes in the extensive margin. As we show below, and as Eaton and Kortum suggest themselves, the functional form of their probability metric is similar to the discrete choice models of market share, pioneered by McFadden (1974). A literal interpretation of their model suggests a conditional logit model, where for each good there are a discrete number of countries from which a good may be imported. We take this conditional logit formulation as the basis for our empirical specification.

Eaton and Kortum (2002) Set-up

3.1 Technology and Preferences

As in DFS (1977), there is a continuum of goods produced, which are indexed on the unit interval. Consistent with Ricardian models, countries have access to the same technology but vary in their efficiency levels. This is captured by a country-goods specific total factor productivity term A_{iz}. Labor is the only production factor, and L_{iz} denotes the labor units used in the production of good *z* in country *i*. The technology of country *i* takes the form,

(1) $$Y_{iz} = A_{iz} L_{iz} .$$

Therefore, the cost for country *i* to produce one unit of good *z* is given by,

(2) $$C_{iz} = \frac{w_i}{A_{iz}}$$

where the wage in country *i* is denoted by w_i.

Geographic barriers take the convenient "iceberg" form, such that delivering a unit from country *i* to country *n*, requires producing $d_{ni} > 1$ units for $n \neq i$, and d_{ii}=1. We also assume the triangle inequality holds, such that for any three countries, *i, n*, and *r,* $d_{ni} \leq d_{nr} d_{ri}$.

Assuming that production of a particular variety is subject to perfect competition, the price a consumer in country *n* faces for a good *z* from country *i* is

(3) $$p_{niz} = \frac{w_i d_{ni}}{A_{iz}}$$

Consumers choose to buy the cheapest goods available; therefore, the price actually paid for good *z* by consumers in country *n* is

(4) $$p_{nz} = \min\{p_{niz}; i = 1...N\}$$

where *N* is the total number of countries.

Facing these prices, final consumers purchase individual goods while maximizing the following objective:

(5) $$U = \left[\int_0^1 Q(z)^{(\sigma-1)/\sigma} dz\right]^{\sigma/(\sigma-1)}$$

where $\sigma > 0$ is the elasticity of substitution among varieties of goods.

3.2 Productivity and Trade Flows

Eaton and Kortum's (2002) paper specifies a probabilistic representation of technological efficiency and assumes that country *i*'s efficiency in producing good *z* is the realization of a random variable A_{iz} (drawn independently for each z) from its country-specific probability distribution $F_i(a) = \Pr[A_i \leq a]$ which is Fréchet (Type II extreme value):

(6) $$F_i(a) = e^{-T_i a^{-\theta}}$$

where $T_i > 0$ and $\theta > 1$. As Eaton and Kortum (2002) formally show, T_i, country *i*'s state of technology, governs the location of the distribution, with higher values indicating that that a high efficiency draw is more likely. T_i captures a country's absolute (technological) advantage. The parameter θ reflects the amount of variation within the distribution, with higher values reflecting less heterogeneity. Moreover, large values of θ mean that comparative advantage exerts a smaller force for trade against the resistance imposed by trade barriers. Treating the distributions as independent across countries, Eaton and Kortum (2002) derive a very elegant expression for the probability that a country exports a particular good to another country *n.*

We modify the Eaton and Kortum (2002) setup in that we allow bilateral tariffs at the goods level to also influence trade patterns. Therefore, in addition to the usual

geographic barriers, we allow that a goods-specific *ad valorem* tariff may be imposed by the importing country. Thus, the total trade costs for country *n* to import a good *z* from country *i*, is denoted $(1+\tau_{niz})d_{ni}$. This goods-specific *ad valorem* tariff rate is the only alteration to the Eaton and Kortum (2002) theory.

Modifying Eaton and Kortum's (2002) probability metric to account for this additional parameter, we have that the probability that country *n* imports a good *z* from country *i* is given by the following expression:

$$(7) \qquad \pi_{niz} = \frac{T_i(w_i(1+\tau_{niz})d_{ni})^{-\theta}}{\Phi_{nz}}$$

where $\Phi_{nz} = \sum_s T_s(w_s(1+\tau_{nsz})d_{ns})^{-\theta}$. Countries with more advanced states of technology, or lower trade and factor costs, will have a higher probability of exporting a particular good. In this way, countries exploit their advantage by selling a wider range of goods.[21]

In our empirical estimation, we only study exports to the United States, and hence the probability that a country will export to the United States. Letting *n* represent the United States, and we can rewrite Equation (7) as:

$$(8) \qquad \pi_{iz} = \frac{\exp(X_{iz}^{'}B)}{\sum_j \exp(X_{jz}^{'}B)} \quad i = 1,2,...,N$$

where $X_{iz}^{'}B = \ln T_i - \theta \ln w_i - \theta(1+\tau_{niz})d_{ni}$. Writing the specification in this way, it is clear that a conditional logit is suggested by the Eaton and Kortum (2002) theory, where the choices are the countries from which the United States may choose to import good *z*.

4. Empirical Strategy

While the Eaton and Kortum (2002) model nicely reduces to a conditional logit, their specification hinges upon the assumption of perfect specialization. In particular, if y_{iz} is an indicator variable that is 1 when country *i* exports good *z* to the United States and 0 otherwise, Eaton and Kortum assume for a given good *z* that if y_{iz} is one for one country, it has to be zero for all the other countries that are studied. It is easy to document

[21] For a general proof of these statements, see Eaton and Kortum's (2002) derivation of the price distributions and properties.

for our fairly disaggregate data that the number of countries that export a particular good varies a great deal across goods. For example, in our sample, the number of countries that export a particular good to the United States ranges from 1 up to 81. This observation clearly violates the perfect specialization assumption, and suggests that there may be goods-specific factors that are relevant for determining the probability of exporting.

One explanation for what we observe in the data that maintains the perfect specialization assumption of Eaton and Kortum is that aggregation affects various goods categories differently. In other words, we do not observe perfect specialization in the data because the HTS grid is not fine enough.[22] We therefore reformulate the conditional logit specification in such a way that we can explain for each good *z* the probability of the vector $Y_z = (y_{1z}, y_{2z}, ..., y_{Nz})$, which describes the observed trade pattern for good *z* across all countries. In this formulation, different from Eaton and Kortum, more than one y_{iz} is allowed to be one. In our specification, we will condition on the number of countries that export the good z. Eaton and Kortum's perfect specialization case with $\sum_{i=1}^{N} y_{iz} = 1$ will then be a special case of a more general formulation that we observe for some goods, but not necessarily for all.

In particular, we let $k_{1z} = \sum_{i=1}^{N} y_{iz}$ be the observed number of countries which export the good *z*, and $k_{2z} = N - k_{1z}$ represents the number of countries that do not export the good. Then the probability that the vector $Y_z = (y_{1z}, y_{2z}, ..., y_{Nz})$ is realized, conditional on the number of countries that export the good, will be given by Equation (9).

$$(9) \qquad \Pr(Y_z \mid \sum_{i=1}^{N} y_{iz} = k_{1z}) = \frac{\exp(\sum_{i=1}^{N} y_{iz} X_{iz}^{'} \beta)}{\sum_{d_{iz} \in S_z} \exp(\sum_{i=1}^{N} d_{iz} X_{iz}^{'} \beta)}$$

[22] An alternative explanation is, of course, that there are goods-specific reasons beyond the Eaton and Kortum model that explain the absence of perfect specialization. As we have learned from the empirical literature on intra-industry trade, to some extent, the empirical literature cannot tell which explanation is the correct one, since ultimately the question is one of how categories of goods are defined. See Finger's (1975) argument that intra-industry trade is a "figment of the product grouping."

where d_{iz} is equal to 0 or 1, $\sum_{i=1}^{N} d_{iz} = k_{1z}$, and S_z is the set of all possible combinations of k_{1z} ones and k_{2z} zeroes. Needless to say, with perfect specialization Equation (9) reduces to Eaton and Kortum's Equation (8). Clearly, when we condition on the number of exporting countries, there are $\frac{N!}{k_{1k}!(N-k_{1k})!}$ possible combinations of k_{1z} ones and k_{2z} zeroes. Denoting the denominator of Equation (9) by $f_z(k_{1i}, N)$, the conditional log likelihood can then be written as Equation (10).

$$(10) \qquad L = \sum_{z=1}^{Z}\left(\sum_{i=1}^{N} y_{iz} X_{iz}^{'}\beta - \log f_z(k_{1z}, N)\right).$$

One way to obtain expression (9) is to start off from a strictly bilateral relationship between country *i* and the United States. We allow the same fundamentals of Equation (8) to determine the trade pattern between both countries, while we do not explicitly assume perfect specialization. Define a latent variable y_{iz}* as the natural log of Equation (8) plus an error term, and allow for multiple countries to export good *z* to the United States as long as each is sufficiently competitive. Noting that as the denominator in (8) is goods specific, we can then write the econometric model as a fixed-effect logit model.

$$y_{iz}^{*} = X_{iz}^{'}B + \alpha_z + \varepsilon_{iz}$$

$$y_{iz} = 1[y_{iz}^{*} > 0]$$

where the goods-specific effect is $\alpha_z = -\ln[\sum_j \exp(X_{jz}^{'}B)]$ and ε_{iz} is the random error with a standard logistic distribution. As is well known, estimating the model with maximum likelihood with goods-specific effects leads to inconsistent estimates for the parameters when the number of countries, *N*, is fixed.[23] A standard approach to circumvent this problem is to treat the goods-specific fixed effects as nuisance parameters and to consider a conditional logit estimation instead for the probability of the *entire* vector $Y_z = (y_{1z}, y_{2z}, ..., y_{Nz})$ that captures the outcome for the *zth* good as a whole,

[23] See Anderson (1970).

conditional on the number of countries that export that good. This approach exactly yields our Equation(9).[24],[25]

5. Results

As a starting point, we estimate the conditional logit model based on Equation (9) for our sample. We look at the decision to export to the U.S. in the last year of the sample, 1999. Based on the estimates for 1999, we will then investigate the extent to which tariff changes between 1989 and 1999 track the actual changes in the extensive margin that are found in the data between both years. We propose a variety of specifications. In the most basic estimation we take as explanatory variables the natural logs of GDP and GDP per capita to capture the overall level of technology. To proxy for trade costs, we take the natural log of the distance from a country to the United States. We measure trade barriers as the estimated *ad valorem* tariff imposed by the United States at the HTS 6-digit level for that country/good pair. The estimation results for this most basic specification are presented in the first column of Table 3. While we get the expected positive and significant signs on the GDP terms and a negative and significant coefficient on distance, the tariff term is negative but insignificant.

One source of concern with respect to estimating the influence of U.S. tariffs on trade is the generalized system of preferences (GSP) program, which allows for duty-free treatment for a broad range of products to qualifying less-developed countries. Recently, there has been some fairly critical literature on the perverse effects that GSP eligibility can have on export performance. For example, Ozden and Reinhardt (2005) argue that developing countries would better be served if fully integrated into the reciprocity-based world trade regime rather than depend on continued GSP preferences. They show that GSP benefits result in less-liberal trade polices of eligible countries, which can influence the ease at which countries may acquire intermediate products, as well as technology

[24] See Hosmer and Lemeshow (1989) and Hammerle and Ronning (1995).

[25] To obtain Equation (9), one applies Bayes' theorem to the probability that country *i* exports good *z*, which is associated with the fixed-effect logit (10): $\Pr(y_{iz} = 1 \mid x_i) = \dfrac{\exp(\alpha_z + X_{iz}^{'} B)}{1 + \exp(\alpha_z + X_{iz}^{'} B)}$.

from abroad, both of which would dampen export performance. In addition, while a good may potentially qualify for duty-free treatment under the GSP program, the United States imposes competitive needs limits, which threaten to withdraw preferences for certain goods if exports reach certain levels.[26] Furthermore, even when the competitive needs limits are not problematic, the stringent rules of origin requirements may inhibit the use of the preference program altogether. Since these preferences are often given to countries precisely because they are not competitive, we fear that not controlling for GSP status causes us to seriously underestimate the negative effect of tariffs on the probability of exporting. In column 2 of Table 3, we therefore include at the aggregate level a country dummy, which is 1 if the country is a GSP beneficiary in 1999. We find a significant and negative effect on a country's GSP status as expected.[27] Furthermore, when controlling for GSP status, the coefficient on U.S. tariffs becomes significant and the negative effect is more than 5 times larger, supporting our concerns that it is critical to control for GSP eligibility.

In column 3, we add additional controls for trade and transportation costs. These include whether the exporting country has a common border with the United States, whether the country is landlocked, whether the country is an island, and if the country shares a common language with the United States. For all variables, we get significant coefficients with the expected signs. In the last column, we also control for the natural log of average gross manufacturing tariffs (lnowntar) that are imposed by the exporting countries themselves. We take the average manufacturing tariffs for exporting countries that are available from the World Bank's *Trends in Average Applied Tariff Rates in Developing and Industrial Countries*. This average variable is meant to capture the costs of acquiring intermediate products from abroad and is meant to address Yi's (2002) concern that vertical integration may be a factor in the increasing extensive margin. In particular, when it is the case that goods cross borders multiple times as in an internationally fragmented production process, the tariffs in the exporting countries may be a relevant factor even when explaining exports to the United States. Also here, we get

[26] For example, when imports from a particular country exceed a certain monetary threshold or if they exceed a certain percentage of all US imports of the good, unless granted a Presidential waiver, the offending country can no longer export that good under the GSP program.

[27] Lederman and Ozden (2004) also find that GSP eligibility leads to lower export volumes.

the expected negative coefficient on the exporting country tariff, so that indeed lower tariffs in the exporting country may stimulate its exports to the United States. Likewise, all coefficients are highly significant.

In Table 4, we allow for variation in the coefficients across major industrial categories. We provide this breakdown also to verify that our findings are not driven by the textile sector and the expiration of the Multifiber Agreements. Using the specification in column 4 of Table 3, we estimate the conditional logit separately for 12 industries: food/beverages/tobacco, textiles/apparel, wood/paper, petroleum/coal, chemicals, plastics/rubber, pottery/china/nonferrous mineral products, steel, metal products, machinery, transport equipment, and other. The estimation results are presented in Table 4. As can be seen, there is quite a bit of variation in the significance and magnitude of the U.S. tariff term. In five industries, we get a negative and significant coefficient: food/bev/tobacco, textiles/apparel, pottery/china, machinery, and other. The magnitudes range from −4.28 (textiles/apparel) to −9.03 (other). In all other industries, except for petroleum/coal, we get an insignificant coefficient. In the petroleum/coal industry, we get an unexpectedly significant, large positive coefficient. With the exception of this industry, in all other industries we get the expected sign and significant coefficients on lngdp, lngdppc, lndist, border, common language. GSP eligibility is negative and significant in all industries except for food/bev/tob. The coefficients on landlocked and island are less robust, sometimes changing signs and losing significance altogether. In almost all industries, we get a significantly negative effect of lnowntar.

While in several industries, both U.S. tariffs and exporting country tariffs do significantly inhibit the probability of exporting to the United States, it is difficult to gauge the magnitude of this effect due to the specific way in which the conditional logit is estimated. As mentioned, the fixed effects are treated as nuisance parameters, and they are not estimated. Consequently, one is not able to calculate marginal effects and to quantify the influence of trade liberalizations on the probability of exporting a good. We therefore supplement the conditional logit estimates with fixed-effect probit estimates. In addition, there may be concern about the endogeneity of U.S. tariffs as suggested by the endogenous protection literature, which predicts that higher levels of import penetration will lead to greater protection. If tariffs are systematically higher for countries that pose

greater competition to U.S. industry or in goods that the United States has a comparative disadvantage at producing, not addressing this endogeneity could seriously underestimate the influence of trade protection on the extensive margin.[28] Here also is it convenient to switch to fixed-effect probits, since endogeneity issues are much easier to treat in probits then in conditional logit models.[29]

We follow Greene (2001, 2003) and estimate a fixed-effect probit "by brute force," i.e. through dummy variables. In the context of nonlinear fixed-effects models this poses a statistical challenge. The "incidental parameters problem" of the maximum likelihood estimator with fixed effects arises. The problem stems directly from the unobserved heterogeneity. Only one coefficient is estimated for these unobserved effects for a group that is of fixed (finite) size. In nonlinear models, any estimation error of such estimates introduces bias in the estimates of the model parameters of interest. Moreover, this error will, given the fixed group size, not vanish as the sample size increases.[30] As Hahn and Newey (2003) note, however, this bias should be small for large enough groups and the size of our groups goes well beyond those that the literature typically considers.[31] Another concern relates to the small samples. As Greene (2001) argues and as his Monte Carlo simulations suggest, however, small sample bias is again, for practical purposes, less of an issue in datasets, such as ours with groups of larger sizes.[32]

To correct for the possibility of U.S. tariffs being endogenous, we use for each of our 12 industries the industrial share of U.S. exports of a country in 1989 as well as the 1989 tariff level as instruments for the U.S. tariffs in 1999. The choice of these relatively aggregate instruments is fairly straightforward. Stronger import competition from a

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[28] In an empirical study of the intensive margin of U.S. imports and how it is affected by nontariff barriers, Trefler (1993) finds that when trade protection is modeled endogenously, its restrictive impact on imports is ten times the size obtained from treating protection exogenously.

[29] This stems from the normal distribution of probit estimation. Assuming a joint normal distribution of the error term in the probit regression and the error in the reduced-form equation for the endogenous regressors significantly reduces the complexity of deriving a two-step estimator in the case of a probit as opposed to a logit.

[30] In linear models incidental bias does not arise. As Greene (2001) notes inconsistent estimates of fixed effects occur (since the variance of the fixed-effect estimator does not go to zero in fixed and small groups), yet they do not carry over to the other coefficient estimates. Group-specific means are sufficient statistics for group-specific effects, and one can estimate the coefficients of interests in de-meaned OLS regression.

[31] Widely referred to in the literature is Heckman (1981) that studies groups of 8.

country is more likely to trigger protection. We take the share from 1989 as well as the tariff from that year since this was the time before the Uruguay round as well as before the NAFTA negotiations were fully underway.

For ease of comparison with the conditional logit estimates in Table 4 and the probit with instrumental variables in Table 6, we also report the probit model estimates without instrumental variables in Table 5. The results from the probit with goods dummies in Table 5 are largely consistent with those found previously for the conditional logit. The signs and significance of the coefficients are similar to those of Table 4. The one difference is that the magnitudes on all coefficients are somewhat lower in absolute value, the importance of which is difficult to discern, however, due to the inability of calculating the marginal effects for the conditional logit model.

As can be seen from Table 6, instrumenting for the endogeneity of tariffs leads to more negative and significant effects of U.S. tariffs in almost all industries. Only in the petroleum/coal and transport industries do the coefficients remain insignificant. From the reported Wald test of exogeneity, we see that there is indeed some concern about the endogeneity of tariffs. In textiles/apparel, wood/paper, plastics/rubber, and other industries, the null hypothesis of the exogeneity of U.S. tariffs is rejected at any reasonable level of confidence.[33] Note that the obtained results for the instrumented probits are consistent with those obtained in the endogenous trade literature, such that the magnitudes of the coefficients increase from 3 to 5 times in absolute value once the endogeneity is taken into consideration.

In order to gauge the overall magnitude of the impact of tariff reductions on the extensive margin we also report the marginal effects with standard errors of the tariff terms in Table 7. As can be seen the marginal effects of U.S. tariffs range from being insignificantly different from zero to −1.67 for the average observation. Taking a weighted average across industries where the weights are the share of goods in each industry, one obtains an average marginal effect of −0.32. Recalling that 1 unit increase

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[32] For probit models, Greene (2003) obtains with groups of only 2 a bias of about 100 percent in estimates of the coefficients of interest. With groups of 20, the bias is less than 10 percent. [Note that bias in the marginal effects, our primary focus, is even smaller: with 20 around 2 percent.]

[33] Note that the case for the endogeneity of tariffs when analyzing the extensive margin of trade is maybe not as strong as for studies of the intensive margin of trade. While protectionist sentiments may be

in the natural log of the gross tariff corresponds approximately to a 100 percentage point increase in the *ad valorem* tariff rate, then lowering the tariff rate by 1 percentage point, the average U.S. tariff reduction over the sample period, increases the probability of exporting a good to the United States by only 0.0032, which is relatively small and suggests that on average the expected number of new goods arising from this reduction would be approximately 11.72 (3,662*.0032).

We quantify the implied impact of U.S. tariff reduction between 1989 and 1999 on the extensive margin across countries as follows. To do so, for each country and industry, we first calculate the expected number of newly traded goods that the model predicts and subtract the expected number of new goods that would be traded had tariffs not changed from their 1989 levels.[34] This difference then indicates the contribution of tariff changes in terms of increasing/decreasing the extensive margin. Figure 1a plots these predicted values against the raw data, i.e. against the total number of new goods that a country exports to the United States between 1989 and 1999. In the extreme case when tariffs would explain all the extensive margin changes, one should observe that the observations fall along the 45-degree line. Instead, what one finds is a rather flat line, with U.S. tariff changes explaining very little of the observed changes in the extensive margin.[35] We can summarize Figure 1a with one number, as we sum both the predicted number of newly traded goods due to U.S. tariff reductions and the actual number of newly traded goods across countries. We find that the tariff reductions between 1989 and 1999 explain 6.7 percent of the newly traded goods that emerge over the period. One possible explanation for our finding could be that our model underestimates the number of newly traded goods. Therefore, in Figure 1b, we plot the predicted number of newly traded goods against the actual number of newly traded goods found in the data. As can be seen, the model does fairly well overall at predicting the number of newly exported

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triggered by whether a good is imported or not, how much of that good is imported (the intensive margin) is probably more of a concern.

[34] This difference amounts to calculating $\sum_{z \in Z'} (\Phi(X_{iz}^{'}\hat{B}) - \Phi(X_{iz}^{'}\hat{B} \mid \Delta \ln ustar = 0))$ where Z' is the set of all goods that were not exported in 1989.

[35] One outlier appears in the figure, that of Romania. This was the only country that we are able to keep in the econometric estimation that switched from having no tariff preferences to obtaining GSP tariff preferences. Therefore, for Romania, we measure the change in tariffs—and consequently the contribution of tariffs on the extensive margin—to be fairly large.

goods and does not show a systematic downward bias. In this light, it is worth reminding ourselves that for the most part the U.S. tariff reductions have been fairly moderate. These findings are in line with what the descriptive statistics in section 2 suggested: U.S. tariff reductions are unlikely the alpha and omega for why the extensive margin changes.

We now turn to the contribution of tariff liberalizations in the exporting country. From Table 7, we can see that taking a weighted average across industries where the weights are the share of goods in each industry, one obtains an average marginal effect of exporting country tariffs of −0.14; therefore, the marginal effects of a 1 percentage point decrease in exporting country tariffs results in an increase in the probability of exporting to the U.S. (on average) by 0.0014 percentage points. Moreover, comparable to the U.S. tariff case, the marginal effects remain relatively small. Similar to Figure 1a, in Figure 1c, we plot the contribution of the tariff liberalizations in the exporting countries (owntariff) to the growth in the extensive margin. Note that this graph is only for a subset of countries, since we do not have 1989 exporting country tariffs for all our sampled countries. From the graph, one notices that the overall contribution of tariff reductions in the exporting countries is somewhat larger than in the case of the U.S. tariffs. However, still we find that overall only 13.1 percent of newly traded goods between 1989 and 1999 can be attributed to tariff reductions in the exporting countries. Again, this should not be too surprising. Similar to Figure 4, in Figure 7 we plot the average manufacturing tariff changes in the exporting countries between 1989 and 1999 against the changes in the extensive margin that we find in the data. Here again, as in the U.S. tariff case, the raw data do not suggest a strong, systematic relationship between tariff reductions in the exporting countries and increases in the extensive margin. What Figure 7 does suggest, however, is that the tariff reductions over that period indeed were significantly larger than for the U.S., especially for many developing countries. This larger size of the tariff reductions in the exporting countries is then the explanation for why we found a somewhat higher contribution of the tariff reductions to the increased extensive margin.

In conclusion, our findings do indicate that U.S. tariffs do affect the extensive margin in a statistically significant way, as has been suggested by Yi (2002), Ruhl (2005), and Kehoe and Ruhl (2002). The magnitudes of the marginal effects combined with the actual changes in U.S. tariffs are so small, however, such that trade

liberalizations on the part of the United States explain very little of the surge in newly traded goods that are seen in the data. Again, in light of the descriptive statistics presented earlier, this is not surprising. As far as the contribution of tariffs in the exporting countries is concerned, the marginal contributions are significant yet small, which supports claims of internationally fragmented production and the contribution of exporting country liberalizations to the U.S. extensive margin. Overall, the contribution of these tariff reductions is larger than in the U.S. case, especially because between 1989 and 1999 many developing countries reduced their initially higher tariffs by a large amount.

Finally, we report some robustness tests. In these alternative estimations, we vary our definition of a traded good instead of looking at the year 1999 exclusively. We have three alternative definitions of an exported good. In the first specification, for a good be considered traded, we require that it is exported in at least one of the three years between 1997 and 1999. The second specification requires that the good is exported in at least two of these three years. Finally, for the third a good is only considered traded if it is exported in all three years. We provide conditional logit estimates (in Table 8) and the fixed-effect probit regressions with instrumental variables (in Tables 9a and 9b) for these three definitions of a traded good. As can be seen, the coefficient estimates are similar in both significance levels and magnitudes of the earlier estimates.

6. Conclusion

In this paper, we use disaggregate U.S. bilateral trade data to investigate a prominent hypothesis in recent studies of trade growth. In particular, it has been argued by Yi (2003), Ruhl (2003), and Kehoe and Ruhl (2002) that changes along the extensive margin of trade may reconcile the strong post-World War II trade growth with the overall moderate tariff reductions. We confirm the importance of trade growth along the extensive margin for exports to the United States. However, we note that the extensive margin of trade has increased significantly between 1989 and 1999 across the board, and not exclusively for countries, such as Mexico and Canada, that were directly involved in comprehensive trade liberalizations with the United States. Our study directly links the disaggregate variation in tariff and tariff preference changes to this changing extensive

margin. In the analysis, we are guided by the canonical Eaton and Kortum (2002) model that is particularly well suited for an analysis of the extensive margin. We estimate conditional logit models and fixed-effect probit models to confirm that tariff reductions increase the set of goods that countries exchange, which is in line with the hypothesis that we investigate.

Our findings, however, suggest that the total effect of the extent of these tariff reductions is likely to be relatively small. Only 6.7 percent of the actual increase in the extensive margin can be attributed to declining U.S. tariffs. In defense of the impact of tariff reductions on the extensive margin, one might attribute this finding in part to the way the extensive margin and changes thereof are measured, even though we observe relatively large changes of the extensive margin and use fairly disaggregate data. Alternatively, one might be inclined to attribute our results to the fact that the tariff reductions on U.S. imports were, all in all, fairly limited. Still, the fairly small marginal effects of U.S. tariff reductions that we find do account for the potential endogeneity of the tariff policy, which tends to boost the size of the estimates. When investigating the impact of tariffs on exporting countries, we find that these are statistically significant also. This supports the hypothesis that in a globally fragmented production process, trade liberalizations in exporting countries do matter for the extensive margin. While the marginal effects of tariff reductions in the exporting countries is (as in the case with the United States) relatively small, the overall contribution of the foreign tariff liberalizations is larger: 13.1 percent of the growing extensive margin can be attributed to tariff reductions in the exporting countries. This result is driven to a large extent by the larger size of the tariff reductions during that period, especially by some developing countries.

Note that our finding that the extent of tariff reductions does not affect the extensive margin in a quantitatively large way does not imply that trade liberalizations as such or within a PTA play a non-negligible role in stimulating new exports. Importantly, we have only considered marginal tariff decreases. Trade liberalizations may have a broader impact on economic activity beyond the effect of a particular tariff reduction.[36] As such, the effects on markets resulting from countries' engaging in formal trade agreements, such as investment liberalizations or the effects of a permanent versus

temporary reduction in tariffs, are aspects of trade agreements that are not assessed here. Trade liberalizations may affect the business climate in a country, expectations about the future course of economic policy and its credibility, all of which are factors that have sometimes been mentioned in explaining trade growth. However, what our findings do seem to say most clearly is that macroeconomic variables and industry/goods effects seem to play a much larger role than the tariff policy of the United States in explaining the changing ranges of goods that countries export. In a world with evolving and increasingly dispersed technology, this may be not much of a surprise. It will be an important challenge in future research to more precisely identify the particular factors beyond tariffs that drive the pronounced extensive margin growth seen in the data.

[36] In Ruhl (2003), what is needed for an increase in the extensive margin is a permanent change in trade policy, which can go beyond a mere reduction in tariffs.

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Figure 1: Model Predictions

Figure 1a: How Much U.S. Tariff Reductions Contribute to Extensive Margin Growth

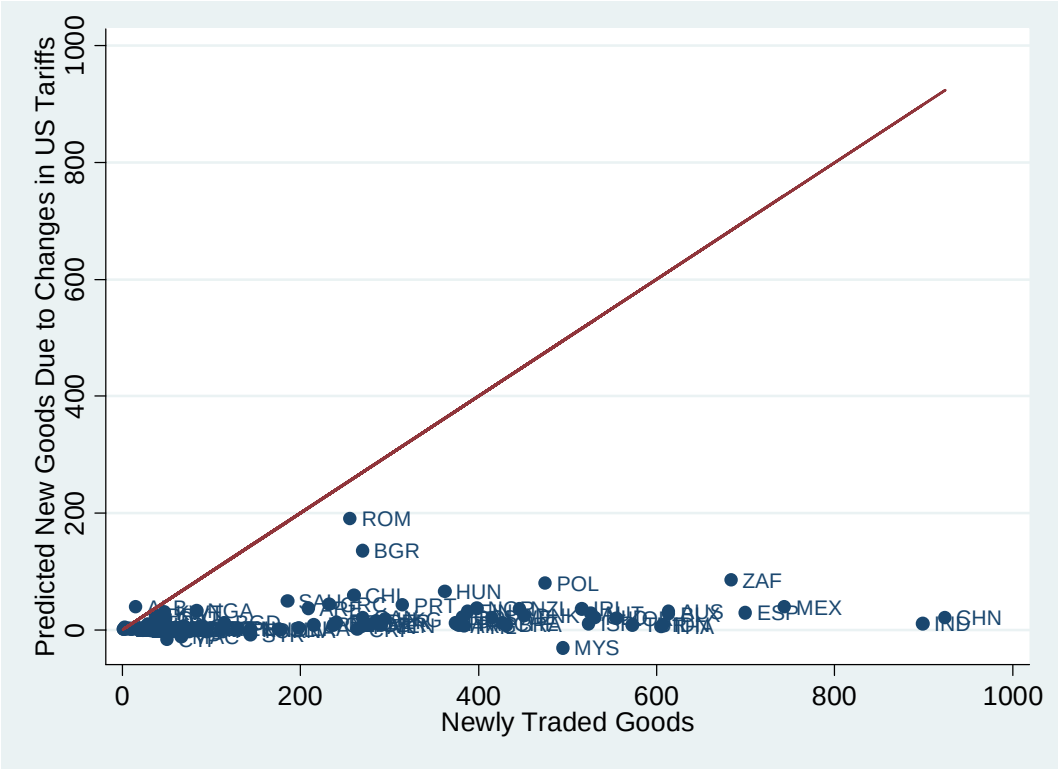

Figure 1b: Predicted versus Actual Newly Traded Goods

Figure 1c: How Much Own Tariff Reductions Contribute to Extensive Margin Growth

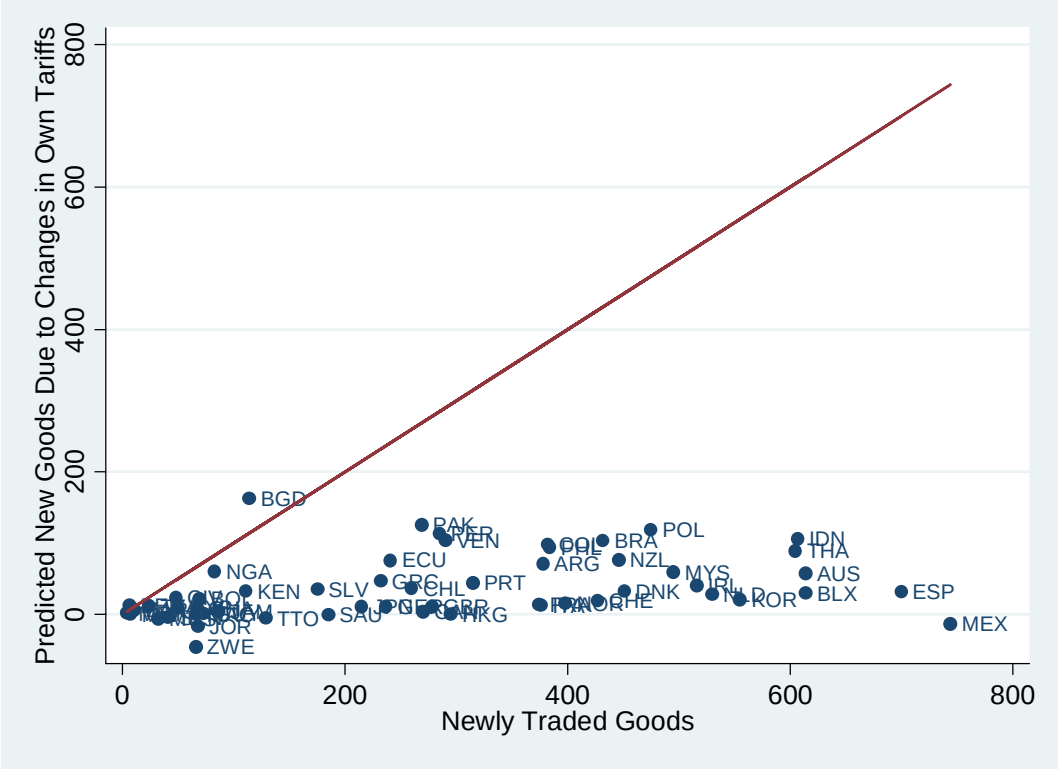

Figure 2: Evolution of Average U.S. Manufacturing Tariffs

Figure 2a: All Relevant Preference Programs

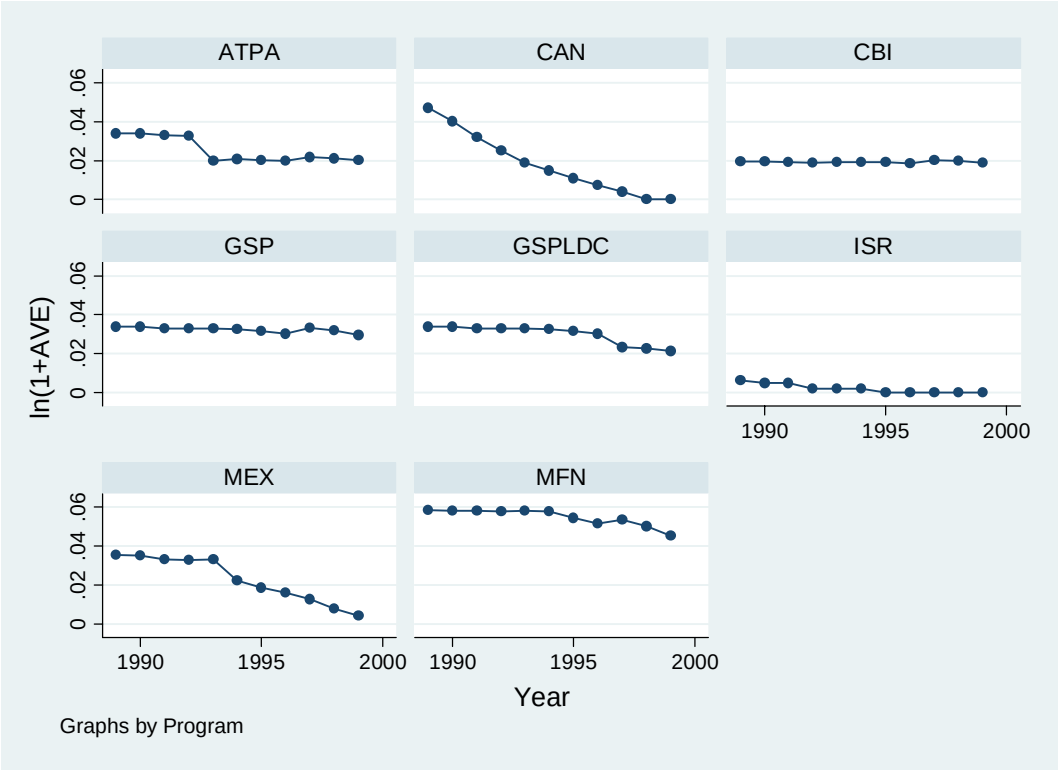

Figure 2b: Countries with no Preferences

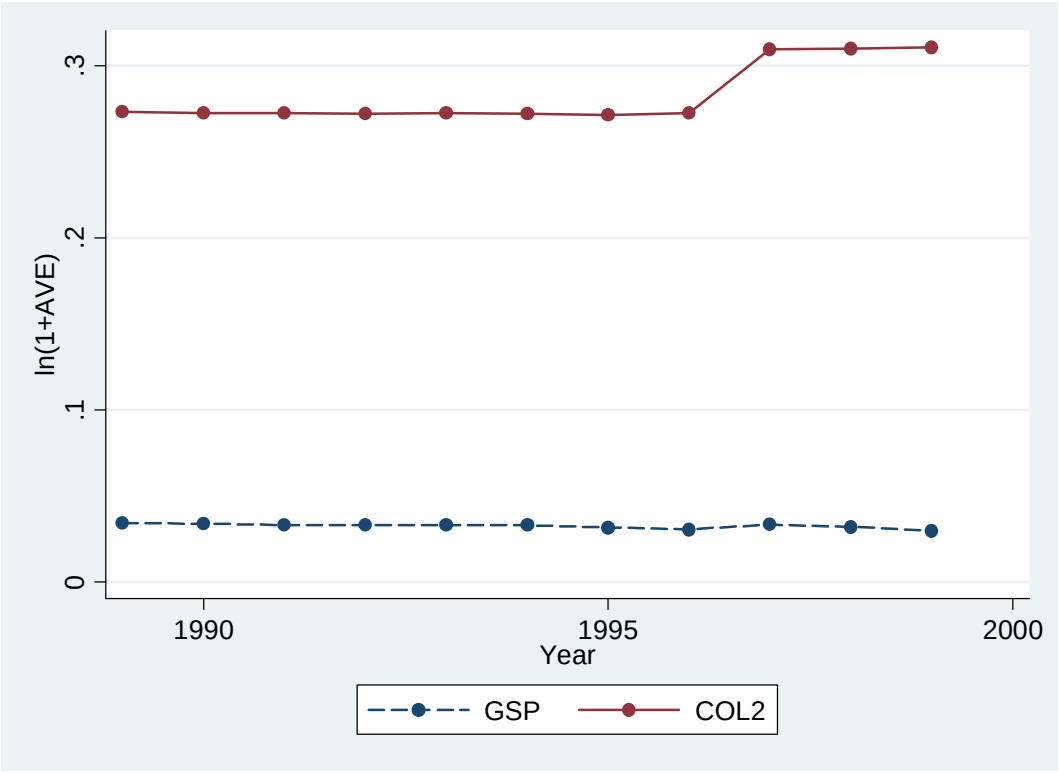

Figure 3: Ranges of Average U.S. Manufacturing Tariffs across Relevant Preference Programs

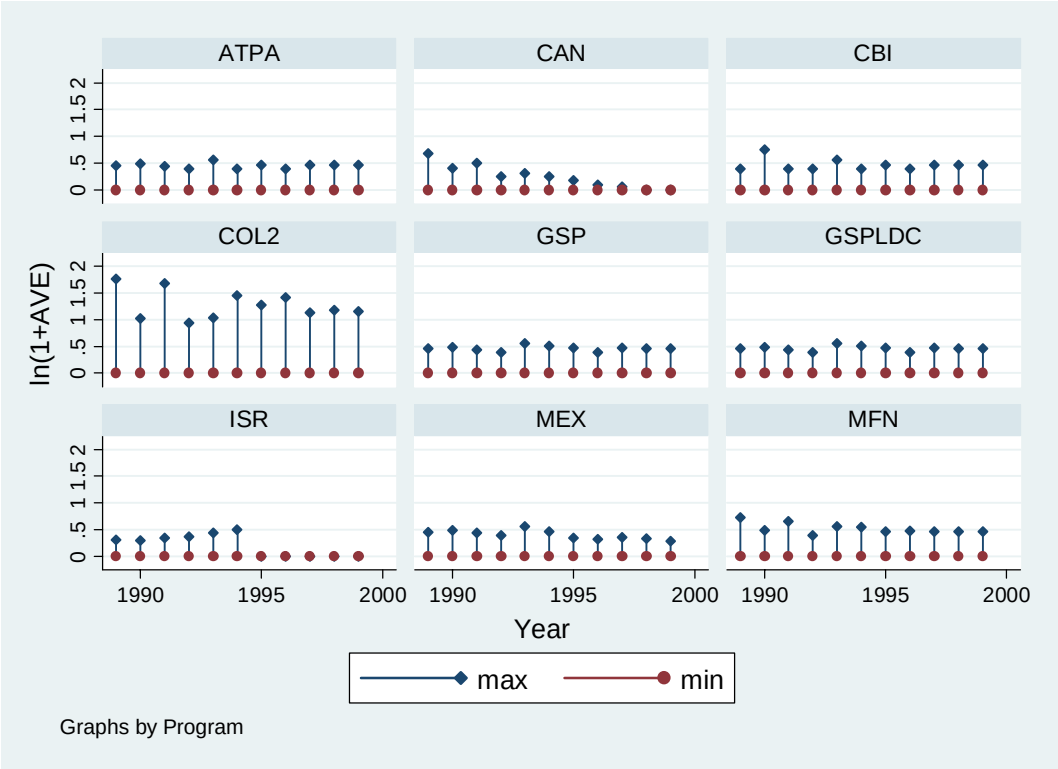

Figure 4: Share of Newly Traded Goods in 1999 Exports

Figure 4a: Quantity Share (number of goods)

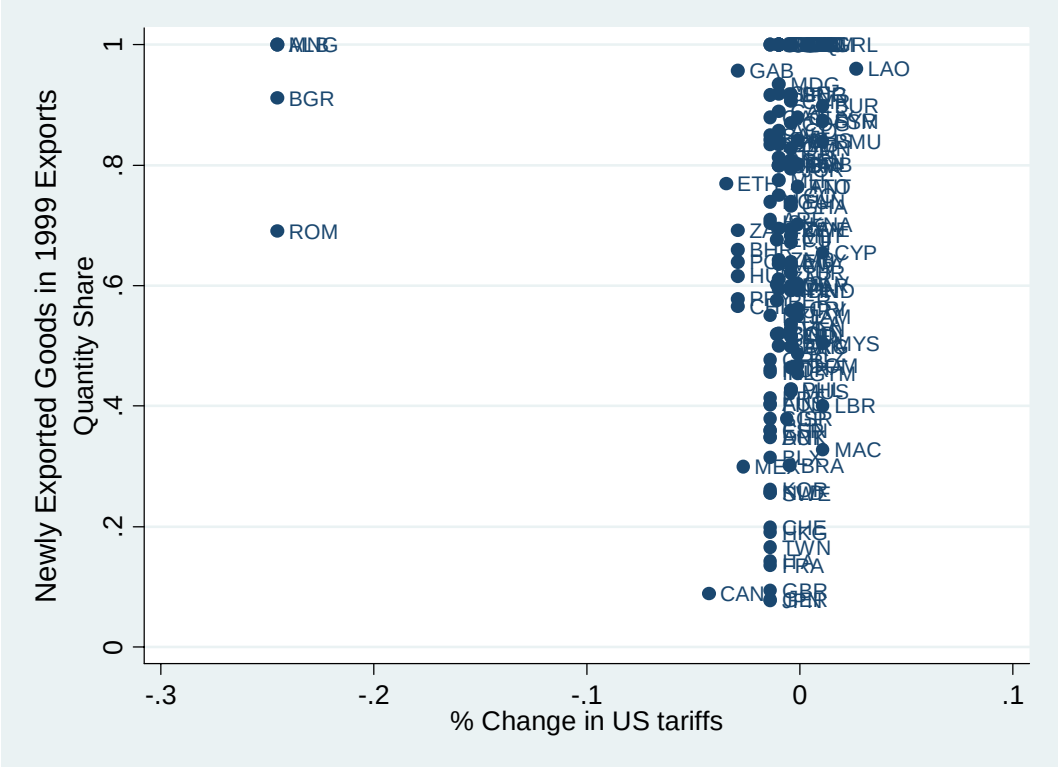

Figure 4b: Value Share (trade volume)

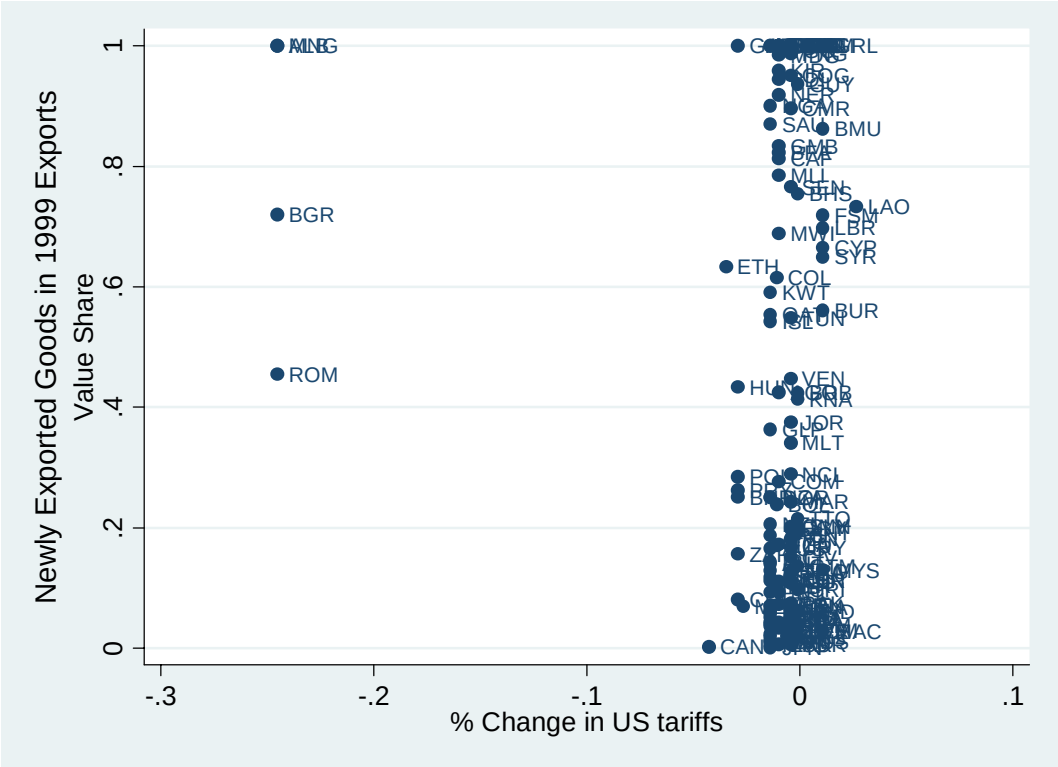

Figure 5: Newly Traded Goods as a Fraction of 1999 Traded Goods

Figure 5a: In Terms of Number of Categories

Figure 5b: In Terms of Value

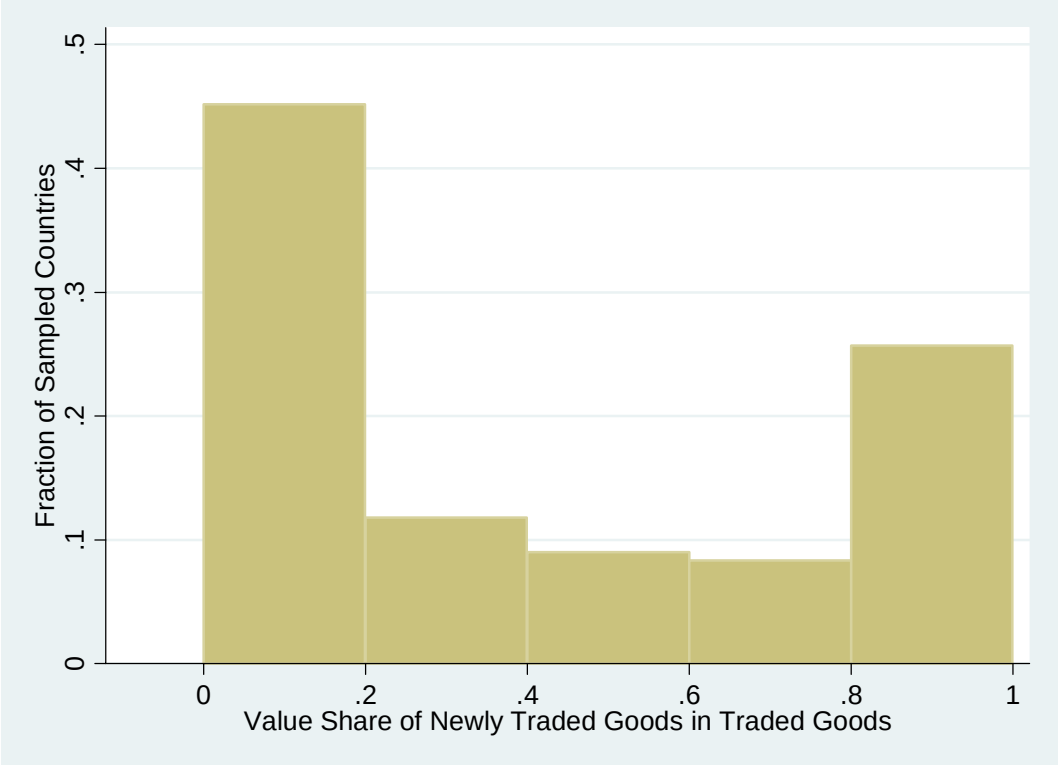

Figure 6: Share of Newly Traded Goods vs. Per Capita GDP

Figure 6a: In Terms of Goods Categories

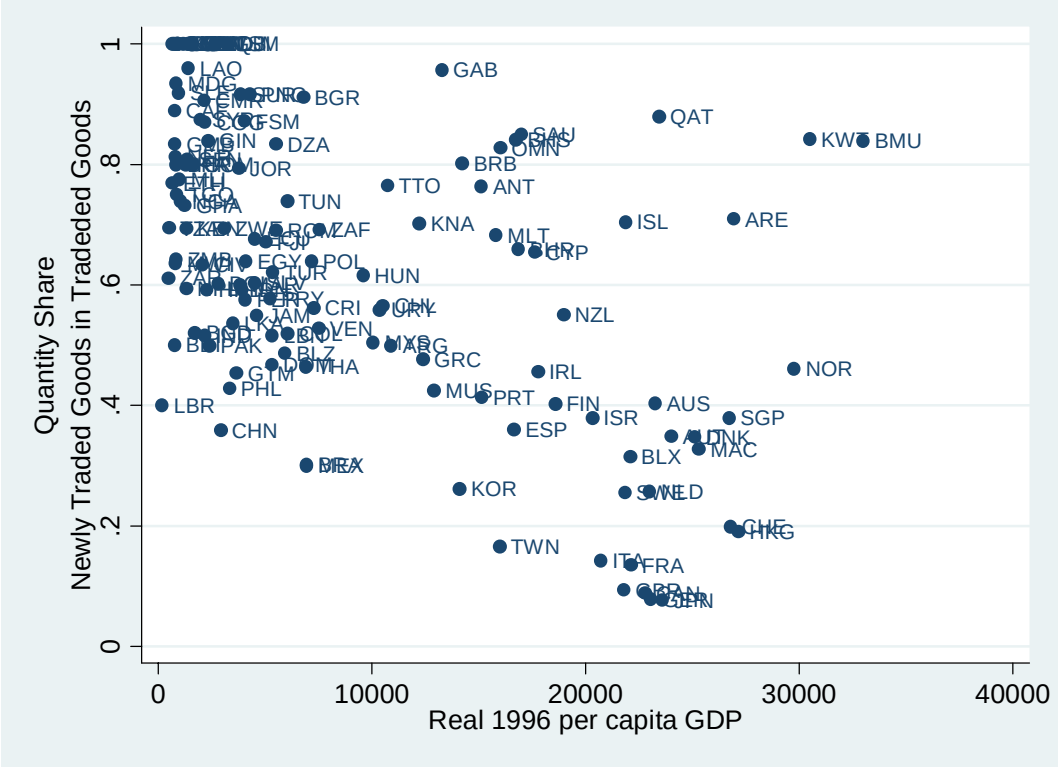

Figure 6b: In Terms of Value

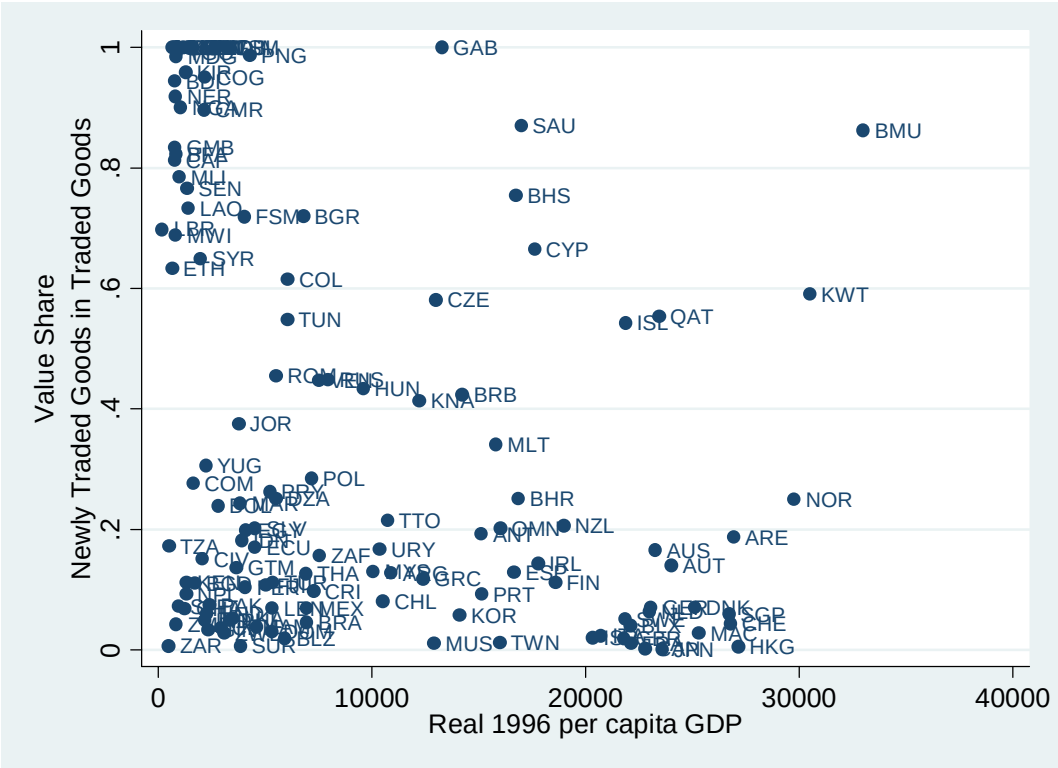

Figure 7: Share of Newly Traded Goods in 1999 Exports

Figure 7a: Quantity Share (number of goods)

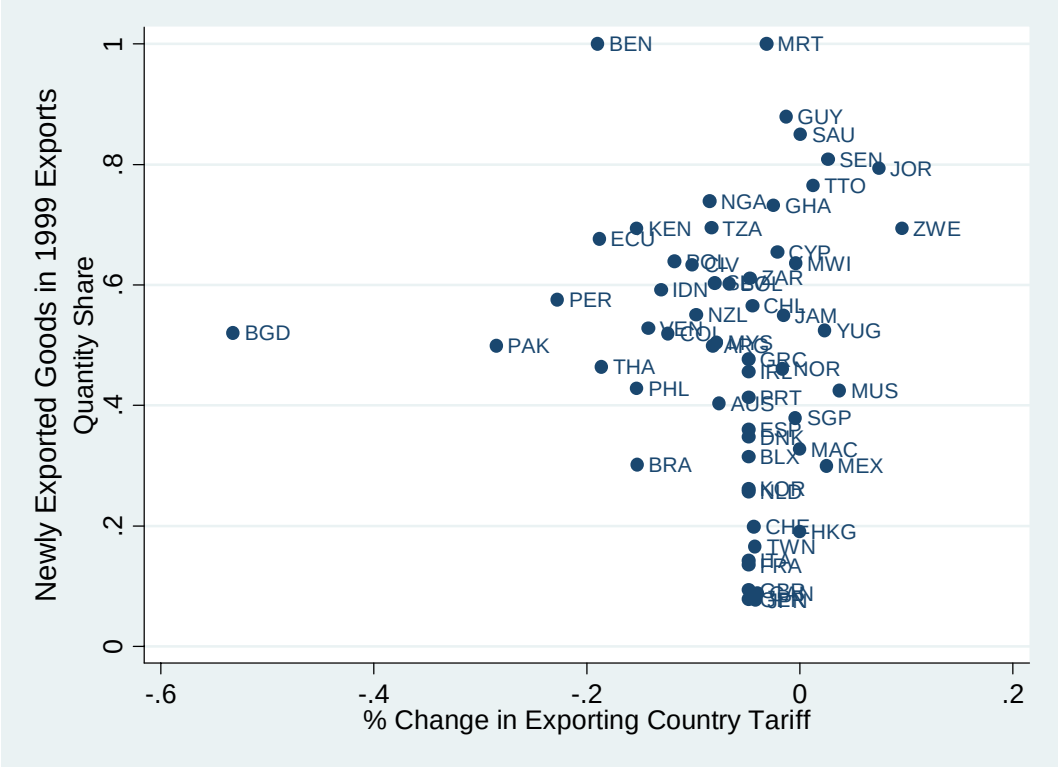

Figure7b: Value Share (trade volume)

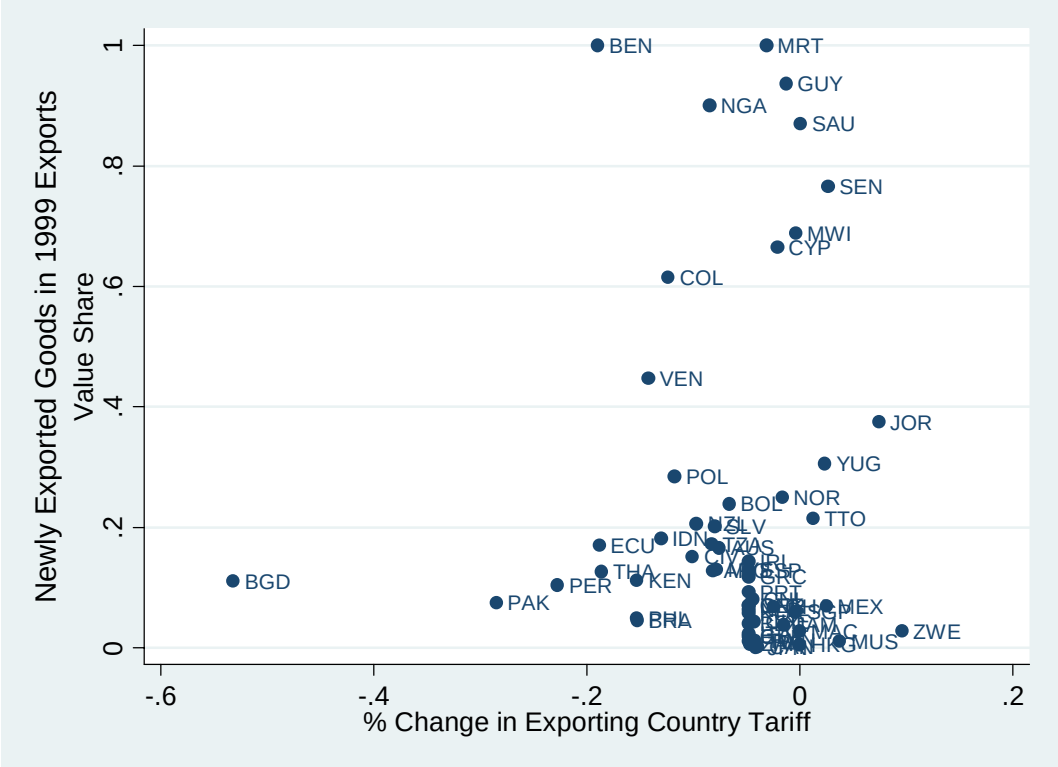

TABLE 1

Classifying export goods to the US

All Permanent Manufacturing HTS 6 Goods Categories: 3,662

Exporting country	all exported goods[1]	newly traded goods[2]	disappearing goods[3]	continuously traded goods[4]
NAFTA				
Mexico	2819	27%	9%	64%
Canada	3413	8%	6%	86%
Col2 to GSP				
Albania	16	94%	6%	0%
Bulgaria	334	83%	9%	8%
Mongolia	79	94%	6%	0%
Former Czechoslovakia	968	77%	6%	17%
Romania	440	59%	15%	26%
Former USSR	1192	81%	5%	14%
China	2773	34%	5%	61%
All other countries	80569	30%	17%	53%

NOTES

1. # of goods exported either at beginning or end of sample
2. exported only at end of sample, percent of all exported goods
3. exported only at beginning of sample, percent of all exported goods
4. exported at beginning and end of sample, percent of all exported goods

TABLE 2

Mexican exports versus non-NAFTA exports

All permanent HTS 6 goods

Newly Exported Goods from Mexico[1] : 771

	Corresponding Exports from RoW	
Newly Traded[1] Goods	Disappearing[2] Goods	Continuously Exported[3] Goods
5548	2454	6465
38%	17%	45%

Disappearing Exports from Mexico[2] : 248

Corresponding Exports from RoW		
1258	920	1721
32%	24%	44%

Continuous Exports from Mexico[3] : 1800

Corresponding Exports from RoW		
17065	8673	32209
29%	15%	56%

NOTES

1. goods exported only at end of sample
2. goods exported only at beginning of sample
3. goods exported at beginning and end of sample

TABLE 3

Conditional Logit Results-Aggregate

	1		2		3		4	
	coef	se	coef	se	coef	se	coef	se
lnustar99	-0.41	0.46	-2.78***	0.47	-2.12***	0.48	-2.45***	0.51
lngdppc99	0.80***	0.01	0.57***	0.01	0.62***	0.01	0.45***	0.01
lngdp99	1.08***	0.01	1.05***	0.01	1.06***	0.01	1.08***	0.01
lndist	-0.73***	0.01	-0.73***	0.02	-0.68***	0.02	-0.65***	0.02
gsp99			-0.59***	0.02	-0.54***	0.02	-0.49***	0.02
border					0.37***	0.05	0.52***	0.05
ldlock					0.40***	0.02	0.32***	0.02
island					-0.11***	0.02	-0.14***	0.02
com_lang					0.49***	0.02	0.52***	0.02
lnowntar99							-3.47***	0.17
no obs	366,165		366,165		366,165		366,165	
Ps R2	0.47		0.48		0.48		0.49	

NOTES

Standard errors are robust

****Significant at the 1% level

**Significant at the 5% level

*Significant at the 10% level

TABLE 4

Conditional Logit Results-By Industry

	Food/Bev/Tob		Text/App		Wood/Paper		Petro/Coal		Chemicals		Plastics/Rubber	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
lnustar99	-7.37***	1.89	-4.28***	0.71	-2.28	3.04	9.42***	2.10	-0.85	1.40	-3.16	2.74
lngdppc99	0.32***	0.05	0.10***	0.03	0.30***	0.07	0.33**	0.12	0.73***	0.05	0.70***	0.09
lngdp99	0.72***	0.02	1.00***	0.01	1.07***	0.03	0.72***	0.09	1.20***	0.02	1.23***	0.03
lndist	-0.60***	0.08	-0.47***	0.04	-0.92***	0.09	-1.22***	0.15	-0.83***	0.05	-0.58***	0.14
gsp99	0.03	0.08	-0.34***	0.04	-0.42***	0.10	-1.05***	0.15	-0.65***	0.06	-0.40***	0.13
border	0.87***	0.17	0.64***	0.12	1.03***	0.23	0.83	0.52	-0.23*	0.12	1.36***	0.42
ldlock	-0.65***	0.09	0.21***	0.05	0.18*	0.10	-0.17	0.21	0.55***	0.06	-0.10	0.13
island	-0.32***	0.06	0.20***	0.04	-0.16*	0.08	0.17	0.20	-0.02	0.05	-0.07	0.11
com_lang	0.54***	0.06	0.11***	0.03	0.58***	0.07	0.01	0.18	0.34***	0.04	0.66***	0.12
lnowntar99	-2.54***	0.56	-4.42***	0.32	-6.61***	0.68	4.07***	1.50	1.23**	0.52	-4.18***	0.90
no obs	29,355		72,100		18,540		3,090		76,426		8,446	
Ps R2	0.324		0.428		0.490		0.387		0.507		0.558	

	Pot/China		Iron and Steel		Metal Products		Machinery		Transport		Other	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
lnustar99	-4.30**	1.84	0.77	5.27	-1.96	1.95	-6.06***	1.86	-4.02	4.65	-9.03***	2.37
lngdppc99	0.44***	0.08	1.08***	0.11	0.77***	0.05	0.96***	0.04	1.00***	0.10	0.52***	0.07
lngdp99	1.21***	0.04	1.33***	0.04	1.28***	0.03	1.22***	0.02	1.21***	0.06	1.07***	0.03
lndist	-0.73***	0.10	-0.58***	0.12	-0.75***	0.08	-0.90***	0.05	-0.58***	0.13	-0.22***	0.08
gsp99	-0.31***	0.10	0.11	0.13	-0.41***	0.08	-0.64***	0.05	-0.12	0.15	-0.80***	0.09
border	1.09***	0.30	0.86***	0.27	0.62***	0.16	0.23*	0.13	1.68***	0.35	0.64***	0.17
ldlock	0.05	0.13	0.35***	0.13	0.47***	0.07	0.55***	0.05	0.47***	0.18	0.49***	0.08
island	0.03	0.09	-0.53***	0.10	-0.57***	0.06	-0.40***	0.04	-0.21*	0.11	-0.14**	0.06
com_lang	0.40***	0.10	0.54***	0.09	0.87***	0.06	0.91***	0.05	0.74***	0.11	0.97***	0.06
lnowntar99	-4.09***	0.94	-1.45	1.09	-3.24***	0.62	-3.50***	0.44	-4.28***	1.06	-3.93***	0.56
no obs	12,566		14,729		34,299		60,358		9,991		26,265	
Ps R2	0.518		0.539		0.553		0.571		0.544		0.502	

NOTES

Standard errors are robust

****Significant at the 1% level

**Significant at the 5% level

*Significant at the 10% level

TABLE 5

Probit Results-By Industry (with good fixed effects)

	Food/Bev/Tob		Text/App		Wood/Paper		Petro/Coal		Chemicals		Plastics/Rubber	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
lnustar99	-3.72***	0.64	-2.15***	0.37	-0.77	1.25	4.14***	1.32	-1.83***	0.42	-1.35	1.24
lngdppc99	0.17***	0.02	0.06***	0.01	0.17***	0.03	0.14*	0.07	0.32***	0.02	0.38***	0.05
lngdp99	0.39***	0.01	0.56***	0.01	0.59***	0.01	0.39***	0.03	0.58***	0.01	0.67***	0.02
lndist	-0.35***	0.03	-0.30***	0.02	-0.54***	0.04	-0.62***	0.10	-0.50***	0.02	-0.37***	0.06
gsp99	0.00	0.04	-0.22***	0.02	-0.23***	0.05	-0.62***	0.11	-0.40***	0.03	-0.25***	0.07
border	0.53***	0.08	0.38***	0.06	0.62***	0.12	0.62**	0.29	-0.22*	0.06	0.76***	0.22
ldlock	-0.34***	0.05	0.12***	0.02	0.11**	0.05	-0.03	0.14	0.31***	0.03	-0.07	0.07
island	-0.17***	0.04	0.14***	0.02	-0.06	0.05	0.07	0.11	0.07	0.03	0.01	0.07
com_lang	0.32***	0.03	0.07***	0.02	0.34***	0.04	0.03	0.10	0.19***	0.02	0.38***	0.06
lnowntar99	-1.23***	0.30	-2.10***	0.18	-3.51***	0.43	1.94	0.86	0.78***	0.27	-2.02***	0.58
no obs	29,355		72,100		18,540		3,090		76,426		8,446	
Ps R2	0.394		0.480		0.538		0.418		0.468		0.563	

	Pot/China		Iron and Steel		Metal Products		Machinery		Transport		Other	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
lnustar99	-1.68*	0.90	-0.70	2.59	0.05	0.80	-3.35***	1.04	0.04	2.99	-4.20***	1.21
lngdppc99	0.25***	0.04	0.53***	0.07	0.38***	0.03	0.50***	0.02	0.52***	0.07	0.26***	0.03
lngdp99	0.66***	0.02	0.71***	0.03	0.69***	0.01	0.64***	0.01	0.63***	0.03	0.57***	0.01
lndist	-0.44***	0.05	-0.43***	0.06	-0.48***	0.03	-0.58***	0.02	-0.42***	0.07	-0.19***	0.03
gsp99	-0.18***	0.06	-0.02	0.09	-0.24***	0.04	-0.43***	0.03	-0.13*	0.07	-0.47***	0.04
border	0.58***	0.15	0.31***	0.14	0.27***	0.09	0.03	0.07	0.91***	0.19	0.34***	0.10
ldlock	0.02	0.07	0.18**	0.07	0.25***	0.04	0.32***	0.03	0.28***	0.09	0.24***	0.04
island	0.04	0.06	-0.23**	0.06	-0.28***	0.04	-0.19***	0.03	-0.09	0.07	-0.02	0.04
com_lang	0.25***	0.05	0.34***	0.06	0.49***	0.03	0.53***	0.03	0.49***	0.07	0.56***	0.03
lnowntar99	-1.84***	0.54	-0.44	0.66	-1.66***	0.35	-1.46***	0.26	-1.79***	0.76	-2.04***	0.34
no obs	12,566		14,729		34,299		60,358		9,991		26,265	
Ps R2	0.538		0.539		0.560		0.567		0.564		0.504	

NOTES

Standard errors are robust

****Significant at the 1% level

**Significant at the 5% level

*Significant at the 10% level

TABLE 6

Full Maximum Liklihood-IVProbit Results-By Industry (with good fixed effects)

	Food/Bev/Tob		Text/App		Wood/Paper		Petro/Coal		Chemicals		Plastics/Rubber	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
lnustar99	-8.18***	1.32	-2.30***	0.49	-5.98***	2.06	0.91	3.23	-1.93*	0.99	-4.59**	1.98
lngdppc99	0.18***	0.02	0.06***	0.01	0.15***	0.03	0.13*	0.07	0.32***	0.02	0.36***	0.05
lngdp99	0.39***	0.01	0.56***	0.01	0.57***	0.02	0.38***	0.03	0.58***	0.01	0.66***	0.02
lndist	-0.31***	0.03	-0.30***	0.02	-0.52***	0.04	-0.61***	0.10	-0.50***	0.02	-0.36***	0.06
gsp99	-0.10***	0.05	-0.22***	0.02	-0.36***	0.06	-0.66***	0.11	-0.40***	0.05	-0.38***	0.09
border	0.42***	0.09	0.37***	0.07	0.57***	0.12	0.59**	0.29	-0.22*	0.06	0.64***	0.22
ldlock	-0.32***	0.05	0.12***	0.02	0.16***	0.06	-0.02	0.14	0.31***	0.03	-0.03	0.08
island	-0.17***	0.03	0.14***	0.02	-0.04	0.05	0.07	0.11	0.07***	0.03	0.02	0.07
com_lang	0.32***	0.03	0.07***	0.02	0.33***	0.04	0.03	0.10	0.19***	0.02	0.37***	0.06
lnowntar99	-1.23***	0.30	-2.10***	0.18	-3.56***	0.43	1.91**	0.85	0.77***	0.27	-2.05***	0.57
no obs	29,355		72,100		18,540		3,090		76,426		8,446	
Prob>Chi2	0.000		0.622		0.001		0.291		0.909		0.033	

	Pot/China		Iron and Steel		Metal Products		Machinery		Transport		Other	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
lnustar99	-1.04	1.45	1.36	3.09	-1.34	1.37	-2.57**	1.36	0.95	4.35	-11.44***	2.10
lngdppc99	0.25***	0.04	0.53***	0.07	0.38***	0.03	0.50***	0.03	0.52***	0.07	0.19***	0.03
lngdp99	0.66***	0.02	0.71***	0.03	0.68***	0.01	0.64***	0.01	0.63***	0.03	0.53***	0.02
lndist	-0.45***	0.05	-0.44***	0.06	-0.48***	0.03	-0.58***	0.02	-0.43***	0.07	-0.17***	0.03
gsp99	-0.15**	0.07	0.02	0.09	-0.30***	0.06	-0.41***	0.04	-0.10	0.11	-0.82***	0.09
border	0.59***	0.15	0.33**	0.15	0.24**	0.10	0.04	0.07	0.92***	0.20	0.13	0.11
ldlock	0.01	0.07	0.16**	0.07	0.26***	0.04	0.31***	0.03	0.27***	0.09	0.34***	0.04
island	0.04	0.06	-0.23***	0.06	-0.27***	0.04	-0.19***	0.03	-0.09	0.08	0.02	0.04
com_lang	0.25***	0.05	0.33***	0.06	0.49***	0.03	0.53***	0.03	0.49***	0.07	0.53***	0.03
lnowntar99	-1.84***	0.55	-0.44	0.66	-1.68***	0.35	-1.44***	0.27	-1.77**	0.76	-2.22***	0.32
no obs	12,566		14,729		34,299		60,358		9,991		26,265	
Prob>Chi2	0.560		0.239		0.208		0.395		0.708		0.000	

NOTES

Standard errors are robust

****Significant at the 1% level

**Significant at the 5% level

*Significant at the 10% level

TABLE 7

Marginal Effects-IVProbit Results

	Food/Bev/Tob		Text/App		Wood/Paper		Petro/Coal		Chemicals		Plastics/Rubber	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
lnustar99	-0.55***	0.10	-0.37***	0.08	-0.47***	0.17	0.09	0.31	-0.06*	0.03	-0.60**	0.26
lnowntar99	-0.08***	0.02	-0.34***	0.03	-0.28***	0.03	0.19**	0.08	0.03***	0.01	-0.27***	0.07
no obs	29,355		72,100		18,540		3,090		76,426		8,446	

	Pot/China		Iron and Steel		Metal Products		Machinery		Transport		Other	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
lnustar99	-0.08	0.11	0.02	0.04	-0.07	0.07	-0.17*	0.09	0.01	0.06	-1.65***	0.34
lnowntar99	-0.14***	0.04	-0.01	0.01	-0.08***	0.02	-0.09***	0.02	-0.02**	0.01	-0.32***	0.05
no obs	12,566		14,729		34,299		60,358		9,991		26,265	

NOTES

****Significant at the 1% level

**Significant at the 5% level

*Significant at the 10% level

TABLE 8

Conditional Logit Results-Alternative Definitions of Exported Goods

	1		2		3	
	coef	se	coef	se	coef	se
lnustar99	-2.22	0.44	-3.23	0.52	-2.06	0.54
lngdppc99	0.51	0.02	0.52	0.02	0.44	0.02
lngdp99	1.05	0.01	1.17	0.01	1.20	0.01
lndist	-0.82	0.02	-0.67	0.02	-0.58	0.02
gsp99	-0.41	0.02	-0.56	0.02	-0.62	0.03
border	0.61	0.05	0.61	0.05	0.69	0.06
ldlock	0.28	0.02	0.44	0.02	0.48	0.03
island	-0.11	0.02	-0.18	0.02	-0.19	0.02
com_lang	0.66	0.02	0.58	0.02	0.48	0.02
lnowntar99	-3.23	0.15	-3.95	0.19	-4.74	0.22
no obs	366,268		365,032		360,397	
Ps R2	0.49		0.52		0.51	

NOTES:

1. A good is exported in at least on year. 2. A good is exported in at least 2 years. 3. A good is exported in all three years.

Standard errors are robust.

TABLE 9a

Alternative Definitionsof Exported Goods: Fixed Effect IV Probit Results, Industries 1-6

	Food/Bev/Tob						Text/App					
	1		2		3		1		2		3	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
lnustar99	-8.38	1.21	-8.52	1.39	-9.53	1.58	-1.84	0.45	-2.96	0.55	-2.84	0.62
lngdppc99	0.20	0.02	0.21	0.02	0.17	0.03	0.09	0.01	0.08	0.01	0.03	0.02
lngdp99	0.40	0.01	0.40	0.01	0.40	0.01	0.56	0.01	0.60	0.01	0.59	0.01
lndist	-0.37	0.03	-0.30	0.03	-0.29	0.04	-0.36	0.02	-0.33	0.02	-0.28	0.02
gsp99	-0.11	0.04	-0.13	0.05	-0.15	0.06	-0.21	0.02	-0.22	0.02	-0.19	0.03
border	0.31	0.09	0.47	0.09	0.45	0.10	0.46	0.07	0.35	0.07	0.35	0.08
ldlock	-0.30	0.04	-0.34	0.05	-0.32	0.06	0.13	0.02	0.21	0.02	0.19	0.03
island	-0.18	0.03	-0.16	0.04	-0.11	0.04	0.17	0.02	0.13	0.02	0.08	0.02
com_lang	0.38	0.03	0.36	0.03	0.31	0.04	0.12	0.02	0.11	0.02	0.11	0.02
lnowntar99	-1.05	0.26	-1.14	0.31	-1.65	0.35	-2.01	0.16	-2.44	0.20	-3.06	0.23

	Wood/Paper						Petro/Coal					
	1		2		3		1		2		3	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
lnustar99	-9.83	1.91	-11.62	2.70	-15.18	3.79	-2.98	3.92	2.50	3.63	8.28	4.48
lngdppc99	0.18	0.03	0.16	0.04	0.11	0.04	0.10	0.06	0.12	0.09	0.19	0.10
lngdp99	0.55	0.01	0.62	0.02	0.65	0.02	0.36	0.03	0.43	0.03	0.49	0.03
lndist	-0.55	0.04	-0.54	0.04	-0.53	0.05	-0.60	0.09	-0.72	0.11	-1.10	0.14
gsp99	-0.38	0.05	-0.45	0.07	-0.51	0.09	-0.71	0.10	-0.70	0.12	-0.67	0.17
border	0.60	0.12	0.67	0.13	0.67	0.13	0.86	0.34	0.49	0.29	0.26	0.32
ldlock	0.21	0.05	0.22	0.06	0.17	0.07	-0.05	0.12	0.05	0.15	-0.04	0.18
island	0.01	0.04	-0.03	0.05	-0.15	0.05	0.00	0.10	0.09	0.12	0.29	0.15
com_lang	0.38	0.04	0.37	0.04	0.38	0.05	0.08	0.09	-0.10	0.12	-0.18	0.16
lnowntar99	-3.15	0.35	-3.95	0.45	-4.65	0.52	1.30	0.74	0.86	0.95	2.52	1.15

	Chemicals						Plastics/Rubber					
	1		2		3		1		2		3	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
lnustar99	-3.06	0.86	-4.52	1.27	-4.86	1.33	-4.93	1.65	-7.66	2.44	-5.57	2.97
lngdppc99	0.31	0.02	0.35	0.03	0.35	0.03	0.36	0.04	0.37	0.05	0.40	0.06
lngdp99	0.57	0.01	0.61	0.01	0.62	0.01	0.64	0.02	0.76	0.03	0.77	0.03
lndist	-0.55	0.02	-0.49	0.03	-0.50	0.03	-0.45	0.05	-0.30	0.07	-0.18	0.08
gsp99	-0.44	0.04	-0.54	0.06	-0.58	0.07	-0.33	0.08	-0.57	0.11	-0.57	0.13
border	-0.16	0.06	-0.28	0.07	-0.31	0.08	0.53	0.26	0.54	0.23	0.60	0.23
ldlock	0.33	0.03	0.35	0.04	0.37	0.04	0.00	0.07	0.14	0.08	0.15	0.09
island	-0.01	0.02	0.06	0.03	0.12	0.03	0.11	0.07	0.04	0.08	-0.07	0.08
com_lang	0.32	0.02	0.19	0.02	0.06	0.03	0.41	0.06	0.28	0.07	0.18	0.07
lnowntar99	0.15	0.23	0.46	0.29	0.64	0.34	-1.97	0.52	-2.50	0.63	-2.17	0.75

NOTES:

1. A good is exported in at least on year. 2. A good is exported in at least 2 years. 3. A good is exported in all three years.

Standard errors are robust.

TABLE 9b

Alternative Definitionsof Traded Goods: Fixed Effect IV Probit Results, Industries 7-12

	Pot/China						Iron and Steel					
	1		2		3		1		2		3	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
lnustar99	-1.87	1.30	-1.68	1.56	-0.06	1.89	1.24	2.63	5.98	2.99	8.73	3.45
lngdppc99	0.35	0.04	0.31	0.05	0.14	0.05	0.49	0.06	0.59	0.07	0.64	0.08
lngdp99	0.64	0.02	0.74	0.02	0.79	0.02	0.72	0.03	0.82	0.03	0.80	0.03
lndist	-0.57	0.05	-0.50	0.06	-0.51	0.06	-0.57	0.06	-0.57	0.07	-0.42	0.08
gsp99	-0.12	0.07	-0.12	0.08	-0.17	0.09	-0.03	0.07	0.15	0.09	0.19	0.10
border	0.34	0.17	0.76	0.17	0.65	0.16	0.25	0.14	0.42	0.15	0.68	0.17
ldlock	0.08	0.06	0.15	0.07	0.25	0.08	0.17	0.07	0.24	0.08	0.26	0.09
island	0.02	0.05	-0.02	0.06	-0.02	0.07	-0.23	0.06	-0.27	0.07	-0.24	0.08
com_lang	0.37	0.05	0.32	0.06	0.19	0.06	0.48	0.06	0.35	0.06	0.24	0.07
lnowntar99	-1.45	0.47	-2.49	0.57	-3.57	0.64	-1.01	0.58	-1.46	0.72	-0.91	0.82

	Metal Products						Machinery					
	1		2		3		1		2		3	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
lnustar99	-2.47	1.13	-2.67	1.60	-2.70	1.91	-2.92	1.12	-3.25	1.59	-1.48	2.03
lngdppc99	0.39	0.03	0.44	0.04	0.37	0.04	0.52	0.02	0.71	0.03	0.72	0.03
lngdp99	0.64	0.01	0.75	0.02	0.76	0.02	0.62	0.01	0.75	0.01	0.80	0.01
lndist	-0.59	0.03	-0.51	0.04	-0.43	0.04	-0.66	0.02	-0.59	0.03	-0.48	0.03
gsp99	-0.33	0.05	-0.41	0.07	-0.49	0.08	-0.36	0.03	-0.39	0.05	-0.44	0.07
border	0.38	0.11	0.41	0.11	0.32	0.11	0.24	0.08	0.12	0.07	0.17	0.08
ldlock	0.18	0.04	0.31	0.05	0.38	0.05	0.29	0.03	0.34	0.03	0.38	0.04
island	-0.22	0.03	-0.33	0.04	-0.30	0.04	-0.18	0.02	-0.21	0.03	-0.21	0.03
com_lang	0.57	0.03	0.60	0.04	0.47	0.04	0.64	0.02	0.58	0.03	0.46	0.03
lnowntar99	-1.72	0.29	-2.03	0.40	-1.93	0.43	-1.42	0.22	-1.06	0.31	-1.40	0.38

	Transport						Other					
	1		2		3		1		2		3	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
lnustar99	-1.07	3.22	-4.00	3.58	-5.84	4.35	-6.96	1.47	-14.32	2.12	-16.73	2.70
lngdppc99	0.55	0.06	0.72	0.07	0.51	0.10	0.25	0.02	0.20	0.04	0.10	0.05
lngdp99	0.59	0.02	0.76	0.03	0.85	0.05	0.54	0.01	0.60	0.02	0.60	0.03
lndist	-0.53	0.06	-0.58	0.09	-0.47	0.10	-0.28	0.03	-0.17	0.04	-0.05	0.04
gsp99	-0.09	0.09	-0.11	0.13	-0.18	0.16	-0.59	0.07	-0.95	0.10	-1.16	0.13
border	1.03	0.22	0.94	0.21	0.85	0.22	0.32	0.12	0.11	0.12	0.15	0.14
ldlock	0.31	0.08	0.37	0.10	0.33	0.12	0.27	0.04	0.48	0.05	0.48	0.05
island	-0.03	0.06	-0.09	0.08	-0.15	0.10	0.03	0.03	0.05	0.04	0.02	0.05
com_lang	0.54	0.06	0.56	0.08	0.45	0.09	0.55	0.03	0.54	0.04	0.47	0.04
lnowntar99	-1.54	0.60	-0.83	0.87	-4.05	1.17	-2.10	0.27	-2.75	0.36	-3.52	0.44

NOTES:

1. A good is exported in at least on year. 2. A good is exported in at least 2 years. 3. A good is exported in all three years.

Standard errors are robust.

TABLE A1

Aggregated Countries

Restructured Countries	Aggregated Countries
Former USSR	Azerbaijan
	Armenia
	Georgia
	Kazakhstan
	Kyrgystan
	Tajikistan
	Turkmenistan
	Uzbekistan
	Belarus
	Estonia
	Latvia
	Lithuania
	Moldova
	Russia
	Ukraine
	USSR
Yugoslavia	Bosnia
	Croatia
	Macedonia
	Slovenia
	Serbia
	Yugaslavia
Czechoslovakia	Czechoslovakia
	Czech Republic
	Slovakia
Germany	East Germany
	West Germany
Yemen	North Yemen
	South Yemen

TABLE A2

Countries/Regions included in the descriptive statistics

Burma	Egypt	Lao	Samoa
Albania	El Salvador+	Lebanon	Saudi Arabia
Algeria	Equatorial Guinea	Liberia	Senegal
Angola	Ethiopia	Macau	Seychelles
Argentina	Falkland Islands	Madagascar	Sierra Leone
Australia	Fiji	Malawi	Singapore
Austria	Finland	Malaysia	Somalia
Bahamas+	France	Mali	South Africa
Bahrain	French Guiana	Malta	Spain
Bangladesh	Gabon	Mauritania	Sri Lanka
Barbados+	Gambia	Mauritius	St. Helena
Belgium	Germany	Mexico	St. Pierre and Miquelon
Belize+	Ghana	Micronesia	Suriname
Benin	Gibraltar	Mongolia	Sweden
Bermuda	Greece	Morocco	Switzerland
Bolivia*	Greenland	Mozambique	Syria
Brazil	Guadeloupe	Nepal	Taiwan
Bulgaria	Guatemala+	Netherlands	Tanzania
Burkina Faso	Guinea	Netherlands Antilles+	Thailand
Burundi	Guinea-Bissau	New Caledonia	Togo
Cameroon	Guyana+	New Zealand	Trinidad and Tobago+
Canada	Honduras+	Niger	Tunisia
Central African Republic	Hong Kong	Nigeria	Turkey
Chad	Hungary	Norway	Uganda
Chile	Iceland	Oman	United Arab Emirates
China	India	Pakistan	United Kingdom
Colombia*	Indonesia	Papua New Guinea	Uruguay
Comoros	Ireland	Paraguay	Venezuela
Congo	Israel	Peru*	Yemen
Costa Rica+	Italy	Philippines	Yugoslavia
Cote D'Ivoire	Jamaica+	Poland	Zaire
Cyprus	Japan	Portugal	Zambia
Czechoslovakia	Jordan	Qatar	Zimbabwe
Denmark	Kenya	Romania	
Djibouti	Kiribati	Russia (and Former USSR)	
Dominican Republic+	South Korea	Rwanda	
Ecuador*	Kuwait	Saint Kitts and Nevis+	

Notes:

+ Countries which qualified for CBI preferences

* Countries which qualified for ATPA preferences

TABLE A3

Sampled Countries and abbreviations

Burma	BUR	Ghana	GHA	Oman	OMN
Afghanistan	AFG	Gibraltar	GIB	Pakistan	PAK
Albania	ALB	Greece	GRC	Panama	PAN
Algeria	DZA	Greenland	GRL	Papua New Guinea	PNG
Angola	AGO	Guadeloupe	GLP	Paraguay	PRY
Argentina	ARG	Guatemala	GTM	*Peru	PER
Australia	AUS	Guinea	GIN	Philippines	PHL
Austria	AUT	Guinea-Bissau	GNB	Poland	POL
Bahamas	BHS	Guyana	GUY	Portugal	PRT
Bahrain	BHR	Haiti	HTI	Qatar	QAT
Bangladesh	BGD	Honduras	HND	Romania	ROM
Barbados	BRB	Hong Kong	HKG	Russia	RUS
Belgium	BLX	Hungary	HUN	Rwanda	RWA
Belize	BLZ	Iceland	ISL	Saint Kitts and Nevis	KNA
Benin	BEN	India	IND	Samoa	WSM
Bermuda	BMU	Indonesia	IDN	Saudi Arabia	SAU
*Bolivia	BOL	Ireland	IRL	Senegal	SEN
Brazil	BRA	Israel	ISR	Seychelles	SYC
Bulgaria	BGR	Italy	ITA	Sierra Leone	SLE
Burkina Faso	BFA	Jamaica	JAM	Singapore	SGP
Burundi	BDI	Japan	JPN	Somalia	SOM
Cambodia	KHM	Jordan	JOR	South Africa	ZAF
Cameroon	CMR	Kenya	KEN	Spain	ESP
Canada	CAN	Kiribati	KIR	Sri Lanka	LKA
Central African Republic	CAF	South Korea	KOR	St. Helena	SHN
Chad	TCD	Kuwait	KWT	St. Pierre and Miquelon	SPM
Chile	CHL	Lao	LAO	Suriname	SUR
China	CHN	Lebanon	LBN	Sweden	SWE
*Colombia	COL	Liberia	LBR	Switzerland	CHE
Comoros	COM	Macau	MAC	Syria	SYR
Congo	COG	Madagascar	MDG	Taiwan	TWN
Costa Rica	CRI	Malawi	MWI	Tanzania	TZA
Cote D'Ivoire	CIV	Malaysia	MYS	Thailand	THA
Cyprus	CYP	Mali	MLI	Togo	TGO
Czech Republic	CZE	Malta	MLT	Trinidad and Tobago	TTO
Denmark	DNK	Mauritania	MRT	Tunisia	TUN
Djibouti	DJI	Mauritius	MUS	Turkey	TUR
Dominican Republic	DOM	Mexico	MEX	Uganda	UGA
*Ecuador	ECU	Micronesia	FSM	United Arab Emirates	ARE
Egypt	EGY	Mongolia	MNG	United Kingdom	GBR
El Salvador	SLV	Morocco	MAR	Uruguay	URY
Equatorial Guinea	GNQ	Mozambique	MOZ	Venezuela	VEN
Ethiopia	ETH	Nepal	NPL	Viet Nam	VNM
Falkland Islands	FLK	Netherlands	NLD	Yemen	YEM
Fiji	FJI	Netherlands Antilles	ANT	Yugoslavia	YUG
Finland	FIN	New Caledonia	NCL	Zaire	ZAR
France	FRA	New Zealand	NZL	Zambia	ZMB
French Guiana	GUF	Nicaragua	NIC	Zimbabwe	ZWE
Gabon	GAB	Niger	NER		
Gambia	GMB	Nigeria	NGA		
Germany	GER	Norway	NOR		