The Dark Side of International Trade Agreements*

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Abstract

While increasing trade and foreign direct investment, international trade agreements create winners and losers. Our paper identifies the distributional consequences of international trade agreements at the firm level. We contend that preferential trade agreements and the World Trade Organization expand the activities of the largest and most productive firms by lowering trade costs. We test our argument using confidential firm-level data covering the near universe of U.S. foreign direct investment, as well as preferential and most favored nation tariff data. We find that by lowering trade costs, both preferential liberalization and, to a lesser extent, multilateral liberalization reallocate economic gains from the least to the most competitive firms. Our results unveil the "dark side" of international trade institutions: concentrated benefits largely for the most powerful actors in the global economy and sharp increases in market concentration.

Keywords: foreign direct investment, globalization, inequality, preferential trade agreements, WTO

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1 Introduction

This paper examines the effects of international trade agreements (ITAs) at the firm level to better understand the distributional implications of globalization. Previous studies show that participation in ITAs increases flows of trade (Tomz et al., 2007; Goldstein et al., 2007) and foreign direct investment (FDI) (Büthe and Milner, 2008, 2014). However, trade liberalization also creates winners and losers (Gawande and Bandyopadhyay, 2000; Gawande et al., 2009), and recent evidence suggests that a narrow set of actors enjoys the lion's share of the benefits of membership in the World Trade Organization (WTO) or in its predecessor, the General Agreement on Tariffs and Trade (GATT) (Gowa and Kim, 2005; Goldstein et al., 2007). While the existing research highlights the important redistributive effects of international economic institutions *among* countries, few studies address their consequences *within* countries.[1] We argue that preferential trade agreements (PTAs) and the WTO expand the sales of the most productive firms by lowering trade costs. In explaining how trade institutions reallocate economic gains, our main contribution is to demonstrate using theory and evidence that firm size matters: the biggest, most productive multinational corporations (MNCs) have emerged as the clear winners from the shift toward PTAs. The result is a marked increase in the concentration of economic activity within countries following the formation of PTAs, as shown in Figure 1.

Figure 1 about here

In examining the distributional consequences of trade liberalization at the firm level, our approach departs from much of the prior literature on the political economy of trade, which identifies divisions over trade policy in terms of factors of production or industry lines. The classic study by Rogowski (1987), for instance, adopts Stolper-Samuelson distributional effects of trade to predict class cleavages over trade liberalization. Other influential work instead assumes costly intra-industry factor mobility along the lines of Ricardo-Viner to predict sectoral coalitions in trade politics, with exporting sectors considered the main beneficiaries of trade liberalization (see Hiscox (2002)). Both traditions draw on trade models that assume firms are homogeneous within class

[1]Notable exceptions are Jensen and Rosas (2007) and Manger (2009).

or industry[2], so neither approach can explain firms' varied political stances toward trade openness *within* industries (Jensen et al., 2015).

We argue that the main beneficiaries of ITAs are the largest and most productive firms. Our argument draws on recent advances in international economics showing that firm-level differences ("heterogeneity"), rather than factors or sectors, explain participation in the global economy (Melitz, 2003).[3] Trade liberalization through ITAs lowers the costs of MNCs' trade-related production activities,[4] in which different stages of the production process occur in different countries, and intermediate goods often cross borders several times before the final goods are ultimately exported or consumed domestically.[5] The growing importance of these global supply chains is demonstrated by the fact that intermediates account for 60% of total imports for the majority of OECD countries (Johnson and Noguera, 2012), though less is known about how trade agreements contribute to their expansion.[6] Our argument links the growth of firms' trade-related activities to preferential and multilateral trade agreements.

Our theoretical framework leads to several testable predictions. First, given that preferential liberalization provides discriminatory tariff cuts to PTA partners, we expect that PTAs increase the

[2]The "representative" firm is a convenient simplifying assumption adopted in earlier trade models. Firm homogeneity implies that firms in the same industries do not vary in their observable characteristics.

[3]Only around 3% of U.S. firms engage in trade, and just 1% of U.S. firms both import and export. Firms that do trade are larger, more productive, and more skill and capital intensive than their industry peers that do not (Bernard et al., 2009). While most firms that trade do so with unaffiliated partners, a small number of firms establish production affiliates in foreign countries to take advantage of lower production costs. These multinationals are even larger and more productive than firms that strictly export (Yeaple, 2009).

[4]MNCs are involved in complex operations, driven in part by the formation of global supply chains and the growing importance of trade in intermediate goods (Bilir et al., 2013; Helpman et al., 2004). Horizontal activities are those in which MNC affiliates abroad sell products in the local market in which they are produced. Vertical activities involve exchange between the affiliate and the headquarter firm. Export-platform activities are sales by foreign-based affiliates to third countries, and may comprise both intermediate and finished products.

[5]MNCs account for over 80% of U.S. exports and imports (Bernard et al., 2009). The globalization of production through vertical FDI and intrafirm trade is common across all U.S. industries. These activities are sometimes called "global supply (or value) chains" or "global production networks." In this paper, we refer collectively to these activities as "trade related" to distinguish them from horizontal FDI, which is directed toward selling to the host market.

[6]Intermediates are goods or services used in the production of final goods.

trade-related activities of MNCs operating in PTA partner countries by lowering the costs of selling back to the home market. Yet, in line with models featuring heterogeneous firms (Melitz, 2003), the effect of preferential liberalization will vary across firms: we predict that only the largest, most productive MNCs benefit from the cost advantage generated by the tariff cuts in trade agreements. Second, we expect that preferential liberalization has a larger effect on vertical and export-platform FDI than does multilateral liberalization through the WTO, since WTO membership grants equal market access advantages to producers from all WTO members. Third, to the extent that ITAs principally benefit the largest, most productive firms, we expect increases in the concentration of economic activity in countries that enter trade agreements.

We examine the empirical implications of our argument using confidential firm-level data covering the near universe of U.S. FDI. We link these data with the product-level preferential tariff data of all U.S. trade agreements and the most favored nation (MFN) tariff data of all WTO entrants.[7] We find that a PTA between a host country and the United States increases affiliate exports back to the U.S. market, whereas joining the WTO has little to no effect on these vertical activities. Further, host country participation in the WTO, which lowers the costs of both importing and exporting goods, is associated with higher sales to third countries. We then directly examine our proposed mechanism—reduced trade costs—using the aforementioned tariff data, and find that tariff reduction explains both the increase in vertical activities after a PTA and the increase in export-platform activities after preferential and multilateral trade liberalization. Importantly, the effects of both preferential and multilateral trade liberalization scale with firm size and productivity, suggesting that tariff reductions spur a reallocation of sales from the least to the most competitive MNCs. To examine the redistributive effect of preferential liberalization overall and in a specific case study, we examine changes in the concentration of U.S. MNC activities in all PTA partner countries and of all firms in Vietnam. We uncover large increases in the concentration in PTA partner countries after signing a PTA, with employment concentration increasing on average 12%.[8]

[7]WTO members impose MFN tariffs, on imports from other members, unless countries are part of PTAs, in which case preferential tariffs apply. For further details on WTO tariffs, see (Pelc, 2011).

[8]Country-level changes in employment and sales concentration of U.S. PTA partners appear in Table A.14 of Appendix F.

Our analysis suggests that the political economy consequences of trade liberalization generally, and of preferential liberalization more specifically, may be different than previously thought. While most studies to date would imply that globalization produces diffuse winners and concentrated losers (Frieden, 1991; Schonhardt-Bailey, 1991; Alt et al., 1999; Baker, 2005), our paper suggests instead that the *beneficiaries* of trade liberalization may be highly concentrated. We call this the "dark side" of international trade institutions: the winners are a relatively small number of the largest, most powerful firms; their activities expand with liberalization, driving the less productive (often local) firms out of the market. While aggregate productivity increases may produce welfare gains, our results indicate that trade liberalization produces significant increases in economic concentration, which have the potential for globalization's main beneficiaries (the largest and most productive MNCs) to gain undue political influence.

Our theory and empirical findings also make several specific contributions to the study of international institutions and global governance. We extend the work by Büthe and Milner (2008, 2014) on the linkages between trade agreements and FDI. While Büthe and Milner (2014) show that variation in the design of trade agreements matters for FDI flows, we demonstrate that the impact of PTAs and the WTO varies across firms within industries. In particular, we show that trade agreements affect FDI by reducing trade costs and expanding firms' trade-related sales. Our paper also speaks to the broader debates on the effectiveness of international institutions in general, and ITAs in particular (Mansfield and Reinhardt, 2008; Gray, 2013; Baccini and Urpelainen, 2014; Bechtel and Sattler, 2014). In addition, our findings help explain why smaller firms are more likely to oppose trade agreements, while larger and more productive firms—which appear to disproportionately reap the benefits of PTAs—usually support preferential liberalization (Manger, 2009).

2 Distributional Consequences of Trade Liberalization

We depart from the vast majority of the literature on the political economy of trade, which focuses on the effect of liberalization at the country (Gowa and Kim, 2005; Goldstein et al., 2007; Büthe and Milner, 2008), class (Rogowski, 1987; Hiscox, 2002), or industry level (Hiscox, 2002; Chase, 2003). While the contributions made by these studies have substantively advanced our understanding

of the distributional consequences of trade liberalization, there is a great deal of intra-industry variation in political mobilization over trade policy (Jensen et al., 2015). Recent theoretical and empirical studies show that firm-level heterogeneity is a crucial determinant of trade and investment activities (Bernard and Jensen, 1999; Melitz, 2003). There is strong evidence that exporters are significantly larger and more productive than firms that serve only the domestic market (Bernard and Jensen, 1999). Perhaps more surprisingly, there are also differences between firms that only export at arms' length and MNCs, which are the largest and most productive firms (Helpman et al., 2004).[9] The bottom line is that firms self-select into trade-related production activities based on their productivity because only the largest and most productive MNCs can afford the fixed costs (e.g., establishing and managing a plant abroad) and variable costs (e.g., tariffs and inputs) of investing in production and sourcing from abroad.

We build on these insights to derive predictions about the effects of preferential and multilateral liberalization—which lower variable costs—on MNC activities. First, falling trade costs lower the productivity threshold for export and investment, which results in more trade and the entry of new firms into foreign markets. Second, lower trade costs increase competition in liberalizing markets. Lower tariffs decrease the price of foreign goods, forcing some (less productive) domestic firms to lose market share at the expense of the more productive foreign firms. Third, since highly productive firms export more, and new firms can enter the domestic market, the demand for labor (and other inputs) increases in liberalizing markets. In turn, real wages and production costs go up. The combination of decreasing prices and rising costs raises the domestic productivity threshold, forcing smaller and less productive firms to exit the market (Melitz, 2003).

The main result is that the distributional effects of trade liberalization should differ across firms within industries. The main beneficiaries are the largest, most productive firms, since their market shares and profits increase with the expansion of trade induced by lower tariffs. The least productive firms see their market shares and profits shrink, and are eventually forced out of the market altogether. This important redistributive consequence of ITAs is the focus of our analysis.

[9]Arms' length trade is conducted with unaffiliated parties. Intrafirm trade is between an MNC parent and its global affiliates, or between global affiliates.

2.1 Preferential versus Multilateral Trade Liberalization

ITAs generate two types of trade liberalization. In order to join the WTO, countries implement *multilateral* trade liberalization, whereas the formation of a PTA produces *preferential* trade liberalization.[10] To illustrate the magnitude of preferential cuts, we can compare the tariffs offered by the United States to its various trading partners. In Figure A.2 in Appendix F, we present box plots of the tariff reductions implemented by the United States in all the PTAs signed since 1990.[11] While U.S. tariff cuts are quite similar among trade partners, there is variation across the 20 PTAs. Moreover, Figure 2 shows the average U.S. tariff cut by type of product. The differences in tariff cuts are particularly stark when comparing intermediates versus final and mixed goods.[12]

Figure 2 here

Although both joining the WTO and forming a PTA reduce trade costs, there is a crucial difference between preferential tariffs and MFN tariffs. Preferential tariffs are usually *reciprocal* (PTA members offer proportional tariff reductions to each other) and *discriminatory* (PTA members do not have to lower tariffs with countries that are not party to the agreement).[13] By contrast, MFN tariffs are both reciprocal and non-discriminatory, i.e., any tariff cuts granted to

[10]PTAs and the WTO include many trade-related provisions that increase market competition, e.g., protection of investment and intellectual property rights (IPRs). Such regulatory measures are potentially as important as tariff reductions (Dür et al., 2014). Table A.15 in Appendix F shows the design of all U.S. PTAs, which share a very similar template, and include a large number of additional trade-related provisions (Baccini and Urpelainen, 2014). Similarly, every country that joins the WTO has to sign onto three agreements: TRIMS, TRIPS, and GATS, which regulate investment, IPRs, and services, respectively. Yet the importance of investment protection and tariff reductions is likely to differ across firms and activities.

[11]Tariff cuts capture the difference between MFN tariffs (prior to the formation of PTAs) and preferential tariffs (PRF) in the first year in which the agreement is in force. Data come from the World Integrated Trade Solution (WITS) database and are disaggregated at the HS-6 digit level.

[12]Data on the type of goods come from Francois and Pindyuk (2012) and Bekkers et al. (2012). Goods are categorized as "intermediate consumption," "final consumption," or "mixed use." Figure A.4 and A.5 in Appendix F show that a similar pattern holds for the WTO. There is heterogeneity in MFN tariff cuts implemented by the United States with new WTO entrants, and cuts are larger for intermediates compared to finished goods.

[13]Article XXIV of the GATT/WTO also allows such a discriminatory trade policy among GATT/WTO members. There are also other forms of non-reciprocal tariff reductions under the GATT/WTO regime, such as the Generalized System of Preferences, for which we account in the empirical analysis.

a WTO member have to be extended to other members. For instance, after the U.S.-Chile FTA (signed in 2003), both Chile and the United States cut tariffs with each other without offering similar concessions to the remaining WTO members. However, when Croatia entered the WTO in 2000, the U.S. MFN tariffs with Croatia were set at the same level as those with other WTO members. Similarly, Croatia set MFN tariffs with the United States at the same level as those with other WTO members.

2.2 Empirical Implications of Our Argument

We argue that the distinction between discriminatory and non-discriminatory tariffs has important implications for firms' trade-related activities, particularly for vertical FDI.[14] Our argument can be distilled as follows. First, both PTAs and the WTO should promote the activities of MNCs, but only among the largest, most productive firms. Second, both PTAs and the WTO promote MNC activities by reducing trade costs through tariff cuts. However, the type of trade cost reduction (i.e., discriminatory or non-discriminatory) has different effects on MNC activities. Below we elaborate on the empirical implications of our theory and state our testable hypotheses.

2.2.1 PTAs and Trade-Related Activities

By lowering trade costs, PTAs between the United States and partner countries should have a positive effect on the trade-related activities of the most productive firms. The mechanism is straightforward for "vertical" FDI, characterized by foreign subsidiary sales back to the home country. Lower preferential tariffs make shipping products back to the United States cheaper than shipping them to countries that are *excluded* from a PTA. The effect of a PTA on "export-platform" sales to third countries is less direct. A PTA between the United States and a partner country lowers tariffs for sales originating in the parent company, making inputs imported from the United States to be assembled in the partner country and then sold to third countries cheaper *than for*

[14]For a related argument, see Blanchard (2007).

countries excluded from the PTA. Such a discriminatory reduction in trade costs in intermediate inputs expands affiliate sales to third countries.[15]

Since we focus on the reduction of trade costs as our theoretical mechanism, we should observe increases in the vertical sales of MNC affiliates back to the United States of products for which the United States cuts tariffs. Indeed, preferential U.S. tariff cuts directly reduce the trade costs for affiliates serving the home market. Similarly, we should see increases in the export-platform sales of U.S. MNC affiliates as a result of preferential tariff cuts implemented by partner countries. Indeed, preferential cuts implemented by partner countries reduce the trade costs for foreign affiliates that import intermediates from the United States for production and subsequent export to third countries.

Moreover, due to variations in firm productivity within industries, tariff cuts should trigger a redistribution of sales among U.S. affiliates. Specifically, due to lower trade costs, market competition should increase in partner markets that sign PTAs with the United States, and competitive pressure should be greater in sectors with higher tariff cuts. In turn, increasing competition raises wages and input costs; as the productivity threshold rises, less productive firms (both domestic and U.S. affiliates) are forced to reduce their sales to the United States—and could even get pushed out of the host market. In line with Melitz (2003) and Bernard et al. (2006), the big winners from preferential liberalization are the most productive U.S. affiliates that ship products back to the United States.

Hypothesis 1: *The formation of a PTA between the United States a partner country increases affiliate sales to the U.S. market (to third countries) for the most productive U.S. MNCs through preferential tariff cuts implemented by the United States (by the partner country).*

2.2.2 The WTO and Trade-Related Activities

Joining the WTO leads to lower MFN tariffs, which also reduce trade costs. Products exported from new WTO members to the home market become cheaper, so vertical FDI activities should

[15]We note that trade-related provisions included in a PTA between the United States and a partner country could also positively impact all the U.S. affiliates that operate in the partner's market—even these doing business with countries not covered by the PTA.

also increase after multilateral liberalization. Similarly, lower MFN tariffs should expand export-platform activities. Therefore, as a result of the lower U.S. MFN tariff, U.S. MNCs face lower trade costs when they export to affiliates in the host market; this effect is magnified by the lower tariffs on host market goods when exporting to third countries. As with PTA cuts, the reduction of trade costs triggers a redistribution of sales from the least to the most productive affiliates by increasing competition in the host markets. In sum, the effect of multilateral liberalization is similar to that of preferential liberalization.

Hypothesis 2: *Host country membership in the WTO increases affiliate sales to the U.S. market (to third countries) among the most productive U.S. MNCs through MFN tariff cuts implemented by the United States (by the host country).*

As a corollary, we argue that MFN tariffs, which are set at the same level for all WTO members, will produce weaker distributional effects than preferential tariffs. That is, given their non-discriminatory nature, we expect the effect of MFN tariffs on trade-related activities to be smaller than the effect of discriminatory tariff cuts produced by PTAs with the United States.

Hypothesis 2a: *Among the most productive MNCs, the effect of preferential liberalization on vertical and export-platform sales is larger than the effect of multilateral liberalization.*

The key elements of our theory are the redistribution effect produced by the formation of ITAs and the mechanism through which such redistribution operates: the reduction in trade costs and the expansion of activity among the most productive firms. Simply put, we expect that the effect of PTAs and the WTO on MNC trade-related activities scales with firm productivity, and is triggered by preferential and MFN tariff cuts. Moreover, we expect that U.S. PTAs should increase vertical and export-platform FDI more than a host country's entry into WTO. In sum, we expect that the liberalizing effects of ITAs are highly skewed toward the largest, most productive firms. The big winners in the shift toward preferential liberalization are a small subset of MNCs that are able to expand their trade-related activities and reap greater market shares as a result of tariff reductions. We summarize our argument and hypotheses in Table 1.

Table 1

3 Data and Empirical Model

Our empirical analysis examines MNC trade-related activities (i.e., vertical and export-platform operations) using confidential firm-level data covering the near universe of U.S. FDI collected by the U.S. Bureau of Economic Analysis (BEA).[16] The BEA conducts Benchmark Surveys every five years.[17] Following the literature (Bilir et al., 2013; Antras and Foley, 2009), we use data from the BEA Benchmark Surveys to construct measures of MNC activities based on the destination of affiliate sales.[18] The BEA data allow us to analyze the operations of a panel of U.S. foreign affiliates from 1989-2009.

Given our prediction that preferential and MFN liberalizations have different effects depending on the type of MNC global production activity, we examine both vertical and export-platform sales. Along with total affiliate sales, the survey reports trade-related affiliate sales to both the United States and foreign countries.[19] These data represent our measures of vertical and export-platform sales, respectively.[20]

Our dataset and empirical design allow us to examine how the activities of U.S. MNCs change in response to trade agreements in ways that address three potential shortcomings in the extant literature. First, examining the distributional consequences of trade liberalization within industries requires data that are disaggregated to the level of individual firms. These data allow us to observe changes in the distribution of sales and changes in market concentration following trade liberalization. Second, we are able to test a direct mechanism through which preferential and MFN liberalization operate: tariff cuts, which vary across trading partners and product lines.

[16]These data are collected by BEA for the purpose of producing publicly available aggregate statistics on the activities of U.S. multinational enterprises. In a typical benchmark year, the survey covers over 99% of affiliate activity by total sales, assets, and U.S. FDI. For instance, in the 1994 benchmark survey, participating affiliates accounted for 99.9% of total U.S. FDI.

[17]The benchmark years are 1989, 1994, 1999, 2004, and 2009.

[18]The data have been used in numerous studies in economics and, to a lesser extent, in political science (see Jensen (2013) and Jensen et al. (2015)).

[19]Sales figures broken down by destination are available for majority-owned affiliates only.

[20]As is customary, we take the natural logarithm of sales. We add one to the value of sales prior to the log transformation so as not to exclude affiliates with zero sales. Alternative transformations (such as adding $1,000 to sales, or using sales values in millions prior to taking the natural log; or partitioning sales into deciles), yield substantively similar results.

These effects are usually confounded with other mechanisms related to specific provisions included in the design of trade agreements, e.g., provisions protecting investment or dispute settlement mechanisms.[21] Third, using U.S. affiliates as the unit of analysis allows us to uncover patterns in the data, according to which ITAs reallocate activities among firms based on their size and productivity. This approach allows us to explicitly examine the empirical implications of our theory; panel data techniques, including firm-level fixed effects, increase the plausibility of a causal interpretation of our results.

3.1 Main Independent Variables

Our main covariates capture preferential and MFN participation, firm characteristics, and the product of these variables. To allow for comparison with earlier work, we create a series of variables indicating membership in the WTO and bilateral PTAs with the United States. The variable *PTA with U.S.* is a dummy coded 1 for the first benchmark year after a country signs an agreement with the United States; and 0 otherwise. In the case of Chile, for instance, *PTA with U.S.* equals 1 in 2004 and 2009.[22] With country and year fixed effects, the dummy *PTA with U.S.* is equivalent to a difference-in-differences estimation in which countries that at some point sign a PTA with the United States score 1 for all years in which a PTA with the United States is in existence. The PTA

[21]Prior studies have yielded interesting results by exploiting the variance in the design of trade agreements around the world (Büthe and Milner, 2008, 2014). One challenge inherent in this approach is that the provisions often do not vary dramatically across the PTA agreements of a single country, such as the United States. Hence the source of identifying variance is at the country level, which could confound the estimated effects. To illustrate this point, in Appendix C we reproduce results using the BEA data aggregated to the country level. This exercise allows us to illustrate the consequences of trade agreements, ignoring sectoral and firm-level sources of variation. Table A.1 reproduces results from models of the counts of total affiliates and total affiliate sales, as well as affiliate counts and total sales by type of activity (horizontal, export platform, and vertical) in each country-benchmark year. These results suggest that cumulative PTAs indeed increase FDI by U.S. MNCs, consistent with Büthe and Milner (2008, 2014). Yet the data do not allow us to test whether tariff reductions play any role, since the correlation of affiliate counts and sales with PTA could be a function of investment protection, liberalization, or both. By examining the association between tariff reductions offered by the United States and its partners for specific industries on the one hand, and affiliate-level activities on the other, we are attempting to isolate the effect of trade liberalization, our proposed mechanism through which PTAs and WTO membership increase the global supply chain activities of the most productive firms.

[22]Results are similar if we use the year in which PTAs enter into force.

data come from the Desta database (Dür et al., 2014).[23] In a similar fashion, we create a dummy variable for periods after which a country joins the WTO to assess the effect of MFN liberalization.

Since our hypotheses are about the effect of tariff cuts associated with MFN and preferential liberalization on different MNC activities, we incorporate data measuring tariff cuts offered by the United States and host countries under both PTAs and the WTO. We collected the preferential and MFN tariff data of all U.S. PTAs and all WTO entrants, respectively. We then constructed two variables to directly test our main theoretical mechanism. The first variable is the difference between MFN and preferential tariffs, as described above. We create two versions of this variable: *Tariff Cut*, which measures the nominal level of the tariff concession, and *Tariff Cut (proportional)*, which captures the proportional tariff reduction, i.e., $(MFN - PRF)/MFN$. These two variables equal 0 for countries that have no PTA in force with the United States.[24] Both *Tariff Cut* and *Tariff Cut (proportional)* capture liberalization implemented by the United States, since we are mostly interested in estimating the effect of preferential trade liberalization on sales back to the U.S. market.[25] The second variable, *WTO Cut*, captures the tariff concessions implemented under the WTO by the United States and the host country. This variable is constructed in a similar fashion to *Tariff Cut*.[26]

Our theory predicts that the largest and most competitive firms will be the main beneficiaries of liberalization through ITAs and so we need firm-level variables to capture these characteristics. We draw on Bernard et al. (2009), who demonstrate that self-selection into trade is driven by intra-industry variation: firms that trade are larger, more productive, and more capital intensive than those that do not. Since the number of employees is precisely measured for all affiliates, our empirical specifications rely principally on the number of employees at the affiliate level as our

[23]Data are available at `http://www.designoftradeagreements.org/`.

[24]As noted, data come from WITS (2014) and are disaggregated at the HS 6-digit level. We create a cross-walk to the North American Industry Classification System (NAICS) and collapse the data to the 4-digit level to conform with the BEA industry classifications. See Appendix B for further details.

[25]To save space, we report results using *Tariff Cut (proportional)* only.

[26]As with *Tariff Cut*, we create two versions: *WTO Cut* and *WTO Cut (proportional)*. The results of using either version of the *WTO Cut* variable are similar; we present those for *WTO Cut (proportional)* in the tables below.

proxy for the predicted winners from liberalization.[27] In Tables A.12 and A.13 in Appendix E.5, we show that our main results are consistent with the use of productivity and total assets (physical plant and equipment, or PPE) instead of the number of employees.[28]

We also include a number of other institutional variables in our main regressions. We control for the presence of a *BIT with the U.S.*, *GATT* membership, and the number of PTAs to which the host country is a signatory during the period prior to the benchmark (*Cumulative PTAs*).[29] Descriptive statistics appear in Appendix F (Table A.16).

3.2 Empirical Strategy

Our main model is the following:

$$S_{ajit} = \alpha + \beta_1 Tariff\ Cut_{ij,t-1} + \beta_2\ Size_{aji,t} + \beta_3\ Tariff\ Cut_{ji,t-1} \times Size_{aji,t} + \beta_4\ C_{i,t-1} + \varphi_i + \varsigma_j + \tau_t + \epsilon_{ajit}$$

Tariff Cut includes both preferential and MFN tariff cuts implemented by both the United States and the host country. $Size_{aji}$ is measured in terms of affiliate employment. The interaction term $Tariff\ Cut_{ij,t-1}\ \times\ Size_{aji}$ aims to capture the non-linear relationship between trade liberalization and sales. All models include controls for the host country's (natural log of) GDP per capita C_{it}, along with industry- ς_j, country- φ_i, and year τ_t fixed effects. The country-level fixed effects capture factors such as distance, language, legal systems, and institutional complementarities

[27]Firm employment, physical assets, and productivity are highly correlated (Bernard et al., 2007) due to the economies of scale (Krugman, 1980). See Jensen et al. (2015) for a recent study using size as the main proxy for productivity.

[28]Following Bilir (2014), productivity is measured as Solow residuals. See Appendix A for further details.

[29]For benchmark year z, $Cumulative\ PTAs_{it} = \sum_{t=z-5}^{z-1} PTA_t$. This variable is similar to the one used by Büthe and Milner (2008, 2014). Data come from DESTA (Dür et al., 2014). We note that the number of PTAs included in the DESTA dataset is substantively larger than the number of PTAs included in Büthe and Milner (2008, 2014). This variable includes different estimations in log transformation or as dummies for each quartile of its distribution to allow for a more flexible functional relationship.

among other unobserved host country and U.S.-host country time-invariant characteristics.[30] The industry fixed effects ς_j absorb omitted industry-specific determinants of affiliate activity, including technological requirements and factor-intensities; average firm productivity, size, and concentration levels; and institutional and policy features. Finally, $\beta_1 \ldots$, and β_4 are the coefficients of interest, and ϵ is the error term.

In line with Baier and Bergstrand (2007) and Baier et al. (2014), we use panel techniques to mitigate potential endogeneity bias. In particular, we include country-time and country-industry-time fixed effects, which capture time-varying (as well as time-invariant) country, industry, and country-industry specific unobservables that may influence liberalization as well as firms' trade-related activities. We also introduce headquarter (HQ) fixed effects to control for unobserved heterogeneity at the parent firm level, which could threaten our identification strategy. Among other conditions, HQ fixed effects account for heterogeneity in lobbying power among parent companies.[31] Moreover, in additional models we include industry-specific time trends. These *random growth* models help maintain the parallel trends assumption in the difference-in-differences estimation (Earle and Gehlbach, 2014).[32] All models are estimated using ordinary least squares (OLS), and standard errors are clustered at the country level.

4 Main Results

The ensuing sections sequentially analyze the link between ITAs and vertical and horizontal sales. For each dependent variable we examine the effect of trade agreements in two ways: the first examines PTAs and WTO membership with country-level dummy variables, as is customary in the extant literature. The second directly examines the mechanism—tariff cuts—around which our theory is built.

[30] In robustness tests presented in Appendix E, we add a series of additional political and economic control variables, as recommended by Büthe and Milner (2014). To capture economic and political conditions in the host country in the years prior to and inclusive of the benchmark year, our control variables are (five-year) lagged average values, inclusive of the benchmark year. None of these country-level controls are consistently statistically significant.

[31] Results with HQ fixed effects are shown in Appendix E.5.

[32] Results using other trends, such as country-specific and country-industry-specific trends, are reported in Appendix E.

4.1 Vertical Sales

Table 2 reports the estimates of models of vertical sales from an affiliate in the host country to its parent company in the United States. In the baseline model presented in Column 1, we find that preferential liberalization (PTA with the United States) and MFN liberalization (WTO membership) are positively associated with vertical sales, but the estimated coefficients are not statistically different from zero. Yet GATT membership and having a bilateral investment treaty (BIT) with the United States are associated with higher vertical sales. However, when we control for affiliate size (natural log of employment), BIT is the only relationship that survives (Column 2).

Table 2

Our theory predicts that the largest and most productive firms should gain the most from preferential liberalization. Hence, we expect the effects of PTAs on vertical sales to scale with firm size. In Column 3 of Table 2 we probe this relationship by adding the product of *PTA with U.S.* and affiliate size.[33]

We find that the marginal effect of PTAs on vertical sales is larger for bigger firms (Column 3). The relationships are strong in substantive and statistical terms. To ease the interpretation of the results, we graph the marginal effect of U.S. PTAs across the full range of affiliate employment in Figure 3. We observe that the positive marginal effect of a U.S. PTA becomes statistically significant for firms with more than 90 employees.[34] WTO membership, by contrast, has no relationship with vertical sales back to the United States. This finding is partially at odds with Hypothesis 2, but provides preliminary evidence that preferential liberalization outperforms multilateral liberalization, which is in line with our corollary Hypothesis 2a.

Figures 3

[33]In Table A.13 in Appendix E.5, we present results using affiliate physical plant and equipment assets (PPE, Column 4) and headquarter productivity (Column 5).

[34]A non-trivial number of affiliates report zero employees. Our consultations with BEA staff indicate that these are accurate responses, since some industries, like holding companies, do not require employees to be a legal business entity.

Recall that our main mechanism is the reduction of trade costs arising from preferential and MFN liberalization. Therefore, the effects should vary depending on the level of the cuts, and the type of MNC activities. We therefore place *Tariff Cut (proportional)* on the right-hand side of our model to estimate the effect of cuts on different types of MNC activities. A positive and statistically significant relationship between U.S. preferential tariff cuts and vertical sales (from the affiliate to the U.S. parent) would support Hypothesis 1. Cuts offered by the United States to all WTO members on MFN terms, on the other hand, should have a weaker effect on sales back to the United States (Hypotheses 2 and 2a): affiliates operating in WTO entrant countries face strong competition from firms from other potential source countries—which also enjoy MFN (or even preferential) tariffs.[35] We expect that both preferential and multilateral liberalization scale with affiliate size.

In Columns 5-9 of Table 2, we examine the relationship between tariff cuts and vertical sales. Column 5 shows that tariff cuts offered by the United States under preferential agreements (*PTA Tariff Cut (U.S.)*) are not associated with the vertical activities of the average affiliate; MFN cuts offered by the United States through the WTO are weakly associated with vertical sales. Column 6 reports the interaction between affiliate size and U.S. preferential tariff cuts. As expected, the effect of preferential trade liberalization on vertical sales positively scales with firm size.

Figure 4 illustrates the marginal effect of a tariff cut along the range of affiliate size. U.S. tariff cuts reduce vertical sales from small affiliates, and the marginal effect is positive and becomes statistically significant at the level of 148 employees. For firms right above this threshold, a 10% cut in tariff rates is associated with a 12% increase in sales; the elasticity of sales to tariff cuts increases with firm size.

Our results survive a number of robustness tests. The effect of preferential liberalization scaling with size remains strong and statistically significant when adding industry-country fixed effects and industry-specific trends (Column 8), and in models with industry-country-time fixed

[35]We note that cuts in tariffs on goods for intermediate use by the host country through preferential or MFN liberalization could lead to export-platform sales by reducing the costs of final goods. We explore this relationship in the next section.

effects (Column 9).[36] Multilateral liberalization through the WTO is also non-linear in size, as reported in Columns 4 (WTO dummy) and 7 (WTO cuts). In particular, in Column 7 we find that vertical sales of smaller firms increase faster under the WTO. The relationship between WTO tariff reductions and firm size is positive for small firms and turns negative for bigger firms, but the latter relationship does not attain statistical significance at conventional levels.[37]

Figure 4

A further noteworthy result of this exercise is that BIT is no longer statistically significant once we include tariff cuts. To further probe the impact of BIT on trade-related activities, we interacted BIT with firm size, and the interaction term was not statistically significant. Exploiting variation in the design of BIT using Allee and Peinhardt (2010) data, we are able to distinguish between BITs with and without strong enforcement mechanisms. However, we find that the design of BIT does not appear to affect trade-related activities.[38]

In sum, we find strong support for Hypothesis 1: preferential liberalization increases vertical sales back to the United States. The increase in sales is related to the size of the cut in preferential tariffs offered by the United States to its trading partners, and the effect scales with firm size and productivity. Our results do not fully support Hypothesis 2, since MFN liberalization is only weakly associated with increases in vertical sales and this relationship does not scale with size. Finally, our findings confirm that for vertical FDI, preferential tariff cuts trigger a larger redistribution effect than MFN tariff cuts, as predicted in Hypothesis 2a.

4.2 Export-Platform Sales

In Table 3 we examine the relationship between trade liberalization and export-platform sales.[39] We find that the relationship between having a PTA with the United States and export-platform

[36]Results using PTA and PTA cuts are also robust to excluding Canada and Mexico from the sample.

[37]See Figure A.6 in the Appendix.

[38]Results omitted here and available upon request.

[39]Unfortunately we cannot systematically test the liberalization effect of the tariff cuts offered to the host country in its PTAs with third countries. The BEA data does not record the specific destination of the third-country exports, so we are not able to identify whether those exports go to

sales is also non-linear, as predicted: in this case the increase in exports to third countries in the presence of a PTA is larger for smaller firms (Column 1). A similar pattern is observed for a host country's WTO membership (Column 2): the relationship is positive for smaller firms, but turns negative for the largest affiliates. These results are at odds with Hypothesis 1 and 2. However, recall that we are interested in the effect of tariff cuts (in combination with size) on export-platform sales, since our theoretical mechanism focuses on the reduction of trade costs. Such a mechanism cannot be precisely captured with a country-level dummy, since it does not account for variation across industries. Therefore, we turn to our main tests, which use industry-level tariff data.

Beginning with Column 3 of Table 3, we examine the effects of tariff cuts implemented under preferential and MFN agreements. We find that for the average firm (irrespective of size), host country PTA and MFN cuts are associated with higher exports to third countries. We also find that export-platform activities scale with firm size following both preferential (Column 4) and MFN tariff cuts (Columns 5-9) implemented by the host country.

To illustrate the substantive effects of the tariff cuts, we graph these results. Figure 5 shows the marginal effect of cuts offered by U.S. PTA partners as firm size increases. Affiliates employing more than 13 workers experience an increase in export-platform sales after preferential tariff cuts; the increase in sales is greater for larger firms. Similarly, Figure 6 shows that MFN cuts offered at the time of WTO accession increase export-platform sales by the largest firms only. In this case, the redistribution is even more severe than in the case of preferential liberalization: only affiliates with more than 148 employees increase their export-platform sales after MFN cuts.

Importantly, although the slopes in Figures 5 and 6 are roughly the same, for firms of similar size the marginal effect of preferential cuts on export-platform sales is substantively larger than the marginal effect of MFN cuts. Simply put, the redistribution effect triggered by preferential liberalization is significantly larger than the redistribution effect triggered by multilateral liberalization.

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a particular PTA participant. As a control, we use cumulative PTAs as a proxy for reductions in the cost of exporting to third countries through PTAs.

In sum, we find strong support for both Hypotheses 1 and 2 as well as for our corollary, Hypothesis 2a.[40]

Figures 5 and 6

4.3 Robustness Checks

In Appendix E we report the results of a number of additional robustness checks. First, we endogenize preferential tariff cuts to mitigate concerns about reverse causality. In particular, we instrument for U.S. PTA cuts using tariff cuts implemented by other countries that form PTAs with the same U.S. PTA partner.[41] The results of these two-stage models are substantively and statistically similar to those reported above.

Second, to further mitigate the concerns about reverse causality, we re-run our main models limiting the sample to firms that *did not* conduct trade-related activities *before* the formation of the U.S. PTA. Concretely, we drop observations that have positive vertical and export-platform sales in the pre-PTA period. The intuition is that affiliates without trade-related activities will anticipate smaller benefits from trade liberalization, which may introduce competition to their domestically oriented (i.e., local sales) operations. In other words, the subsample allows us to estimate more conservative effects of trade liberalization among firms for which endogeneity is less likely to be a concern. Our results are substantively unchanged.

Third, we show that our results are robust to entropy balancing, which allows us to better account for firm-level characteristics and omitted variable problems (Hainmueller, 2012). Specifically, by using entropy balancing, observations are re-weighted with respect to *PTA* so that all the relevant firm-level covariates are balanced out (i.e., they have the same mean). We also re-weight for industries with positive cuts, and the results are unchanged.

[40]The results for BITs are similar to the ones discussed for vertical sales. BITs lose statistical significance once we include tariff cuts. Moreover, the design of a BIT and its interaction with size have no statistically significant effect on export-platform sales.

[41]For instance, we use tariff cuts implemented by Canada as a result of its PTA with Costa Rica to instrument for tariff cuts implemented by the United States in its PTA with Costa Rica. See Appendix E.1 for a formal description of this modeling strategy.

5 International Trade Agreements and Market Concentration

We argued that liberalization through ITAs benefits the largest and most productive MNCs, and the results in the previous section provide evidence that this is indeed the case. We now examine the effect of ITAs on market concentration. An implication that naturally follows our argument is that concentration will increase following host country participation in trade agreements, particularly PTAs. We first show that PTAs increase employment and sales concentration among U.S. MNCs in host markets. We also show that the redistribution among domestic firms in host markets is even more severe than the redistribution effect among U.S. affiliates in those markets. We document such an increase in market concentration among all firms operating in Vietnam following its PTA with the United States and its accession to the WTO.

5.1 Evidence from U.S. Affiliates

To further probe the implications of our theory, we examine the effects of preferential (and multilateral) trade liberalization on indices of market concentration in host countries. Using the BEA data, we are able to compute Herfindahl-Hirschman Indices (HHI) of sales (and employment) concentration for U.S. affiliates at the industry level over the benchmark years.[42] We examine how these indices of concentration change following host countries' participation in a PTA with the United States and membership in the WTO. We further explore whether market concentration correlates with the size of the tariff cuts offered under preferential or MFN terms.

Table 4 presents the results from models of employment and sales HHI regressed on PTA, WTO membership, and tariff cuts resulting from preferential and multilateral liberalization.[43] The dependent variables in Models 1-4 are employment HHI computed at the NAICS 4-digit level; in Models 5-8 the dependent variable is HHI of sales, also computed at the 4-digit level. The results of these analyses are quite revealing: PTAs (Columns 1-2 and 5-6) and PTA cuts (Columns 3 and 7) are strongly associated with higher employment and sales concentration in all models, while

[42]The HHI is the sum of the squared firm share of the total sales (or employment) in its industry. Formally, $HHI = \sum_{i=1}^{N} s_i^2$, where s_i is the market share of firm i in the industry, and N is the number of firms in the industry. The index ranges from 1/N to 1, with higher values indicating greater market concentration.

[43]In additional tests we explore the relationship at the country level.

multilateral liberalization produces mixed (and less robust) results. WTO membership is associated with higher employment and sales concentration (Models 2 and 6, respectively), while MFN cuts are negative and statistically significant in the sales HHI models, but not in the employment models. Finally, GATT tends to be associated with lower concentration, but the coefficient is only significant for HHI employment. Finally, a BIT with the United States is associated with lower employment and sales concentration.

Table 4

5.2 Evidence from Vietnam

The previous results suggest that preferential liberalization leads to a higher concentration of sales and employment among U.S. MNCs operating in a partner country. Given that U.S. MNCs tend to be more productive than domestic firms, we would expect trade liberalization to have stronger displacement effects on local firms operating in industries in which U.S. affiliates are active. Ideally, we would explore the effect of tariff cuts on market concentration in all countries that have a PTA with the United States, but data limitations prevent such an exercise. We are, however, able to illustrate the magnitude of changes in market structure before and after the formation of the U.S. PTA with Vietnam, and before and after Vietnam's accession to the WTO.

The choice of Vietnam for these analyses is sensible for three reasons. First, we are interested not only in how the concentration of MNC activity changes following PTAs, but also in changes in the broader market structure, including the reallocation of activities among domestic firms. While the requisite firm-level data are unavailable for most PTA partners, in the case of Vietnam, the Vietnamese General Statistics Office (GSO) collects fine-grained data on the universe of firms operating in the country[44]. Second, Vietnam represents a least-likely case with which to observe the patterns of concentration predicted by our theory. Indeed, it signed a PTA with the United States at the same time it began to privatize many state-owned enterprises (SOEs), which usually held a monopolistic position in the industries in which they operated (Malesky, 2009). This combination of preferential trade liberalization and privatization makes it less likely that we will find a correlation

[44]For another study using GSO data, see Malesky et al. (2015).

between the formation of the PTA with the United States and domestic market concentration. Moreover, the change in HHI calculated based on the number of employees of U.S. MNC affiliates is indeed negative, as reported in Figure 1. Third, Vietnam signed a PTA with the United States in 2001 and entered the WTO in 2007. Therefore, we are able to the test the effect of both preferential and multilateral trade liberalization on market concentration among domestic firms.

Our analysis examines the relationship between tariff cuts and market concentration in Vietnam.[45] In line with our previous tests, the dependent variable is the HHI of sales calculated at the 4-digit industry level. The main independent variables are: (1) the interaction between PTA cut (proportional) implemented by the United States and Vietnam and the average productivity of foreign firms at the industry level and (2) the interaction between MFN cut (proportional) implemented by the United States and Vietnam and the average productivity of foreign firms at the industry level.[46] Our theory predicts that the coefficients of the interaction terms should be positive and statistically significant. Our unit of analysis is industry-year;[47] coverage includes the years 2000–2009.[48]

Figure 7 provides a graphical representation of the main results, which are reproduced in Table A.2 in Appendix D. With the exception of PTA Cut implemented by the United States, all the interaction terms have the expected positive sign and are statistically significant.[49] Our analysis indicates that domestic market concentration increases as a result of tariff cuts in the industries in which highly productive foreign firms operate. Therefore, PTAs with the United States and the WTO are both responsible for increasing market concentration among U.S. affiliates operating in

[45]Detailed information on control variables, model specifications, and estimation techniques are provided in Appendix D.

[46]For each firm, we regress the firm-level log of revenue on firm-level assets, number of employees, industry (HS 2-digit) dummies, and year dummies. The residuals of such a regression (known as Solow residuals) are our time-varying measures of productivity.

[47]Industry classifications are 4-digit International Standard Industrial Classification (ISIC) Revision. We created a cross-walk from the 4-digit ISIC to the 6-digit HS in order to merge the GSO data with tariff data.

[48]Since the Vietnam-U.S. trade agreement was a five-year deal, we have data on preferential tariff cuts only up to 2006. Therefore, models including preferential tariffs cover the years 2000–2006.

[49]Vietnam signed a PTA with the United States as a stepping stone to access the WTO. Therefore, preferential trade liberalization was mostly on the Vietnamese side in such a PTA, whereas tariff cuts implemented by the United States were limited.

host countries (as reported in the previous section) and for increasing market concentration among all firms operating in Vietnam (a U.S. PTA partner).

These results emphasize the severity of the redistributive effect triggered by ITAs among domestic firms. The case of Vietnam suggests that such a redistributive effect is even more severe once we account for the universe of market participants. This is in line with our theoretical framework, since U.S. MNCs are likely to be larger and more productive than the majority of firms operating in host countries. Taken together, our findings indicate that preferential liberalization causes large MNCs to gain significant market share from smaller MNCs and, to an even greater extent, from domestic firms operating in host markets.

Figure 7 about here

6 Conclusion

International economic institutions are a prominent feature of the current wave of globalization, so it is no surprise that there is a heated debate about their effects on important economic outcomes such as trade and FDI (Tomz et al., 2007; Goldstein et al., 2007; Büthe and Milner, 2008; Mansfield and Reinhardt, 2008). Such a debate is fueled by the ongoing deadlock in the Doha Round, the controversial impact of recent International Monetary Fund interventions, and the dramatic proliferation of trade agreements. In this paper we analyzed the impact of international economic institutions on the activities of the most productive and powerful economic actors in the global economy: MNCs. In particular, we focused on the ways in which the WTO and PTAs influence the global supply chain activities of U.S. MNCs.

We argued that preferential and multilateral liberalization should have redistributive effects across firms within industries: the main cleavages should arise between large and small firms, rather than between sectors or factors of production. The source of redistribution depends on the type of MNC activity, the size of the tariff cuts, and the country in which those cuts occur. Cuts offered by the United States on preferential terms should promote sales back to the United States, whereas preferential tariffs offered by the partner would expand sales to third countries. We argued that the

mechanism is similar for multilateral liberalization, although its effects are weaker than the effects of preferential liberalization, given the non-discriminatory nature of MFN tariffs.

Our analysis of firm-level data covering the near universe of U.S. multinationals strongly supports our hypotheses. We find that: (1) the largest/most productive firms disproportionately reap the benefits of liberalization through ITAs; (2) the mechanism operates through the reduction of trade costs; and (3) preferential and multilateral liberalization impact global production activities in different ways: preferential liberalization affects vertical sales and export-platform sales, while the WTO/MFN primarily affects export-platform sales. To our knowledge, we are the first to find that preferential liberalization has led to sharp increases in market concentration in PTA partner countries.

Our paper makes three contributions to the literature. First, we show that ITAs matter, but only for a relatively small number of firms. While the previous literature has argued that globalization produces diffuse winners and concentrated losers (Alt et al., 1999; Frieden, 1991), our study suggests that ITAs benefit the largest firms at the expense of the smaller ones. Thus, the paradox of the New Regionalism (Mansfield and Milner, 1999) is that the proliferation of PTAs generates handsome benefits, but only for a relatively small number of powerful actors. Second, our paper explains the ways in which international institutions contribute to firms' trade-related activities. To our knowledge, our paper is the first to demonstrate the empirical link between tariff cuts through PTAs and the WTO, on the one hand, and the expansion of firms' global supply chains, on the other. Third, our paper suggests that debates over the effects of international institutions on economic and policy outcomes are best informed using evidence at the micro level. Thus, it is natural to change the unit of analysis from countries to companies, which are the most important actors in international trade. When focusing on firms, the effects of trade liberalization appear to be very different from the conventional wisdom. In particular, we find that the expansion of trade through ITAs has highly concentrated beneficiaries within countries and industries.

Finally, our findings have two important policy implications. First, we find that international economic institutions are responsible for the expansion of larger and more productive firms, and for increases in market concentration. To the extent that the redistribution benefits the most skilled workers employed in the most productive firms, and thereby increases income inequality,

the design of such institutions—PTAs in particular—should include provisions that establish adequate safety nets. Second, since PTAs increase market concentration, preferential liberalization should be paired with careful domestic regulations and robust competition policies to avoid the occurrence of monopolies or cartels. Without such institutional remedies, one of the main goals of trade liberalization—enhanced consumer welfare—may not be achieved.

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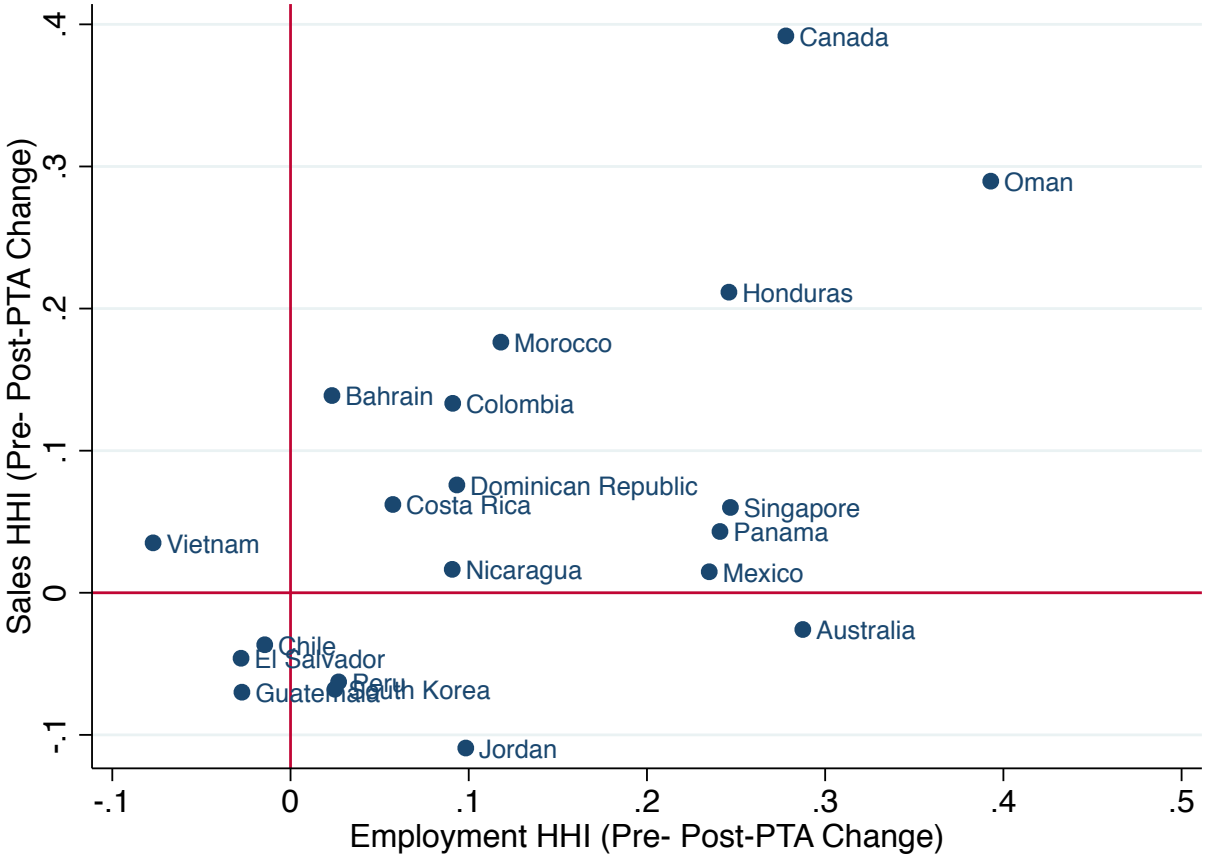
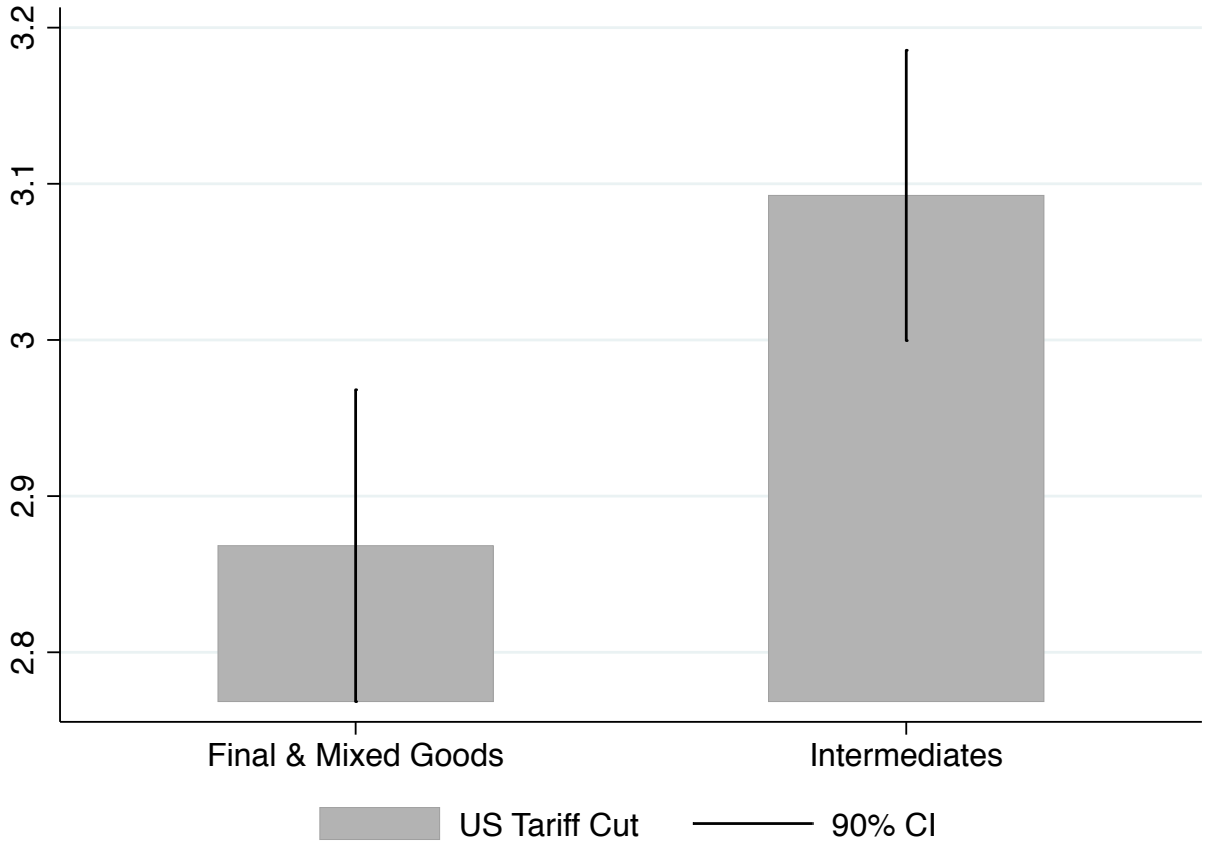
Figures and Tables

Figure 1: Changes in Employment and Sales Concentration after PTA with U.S.



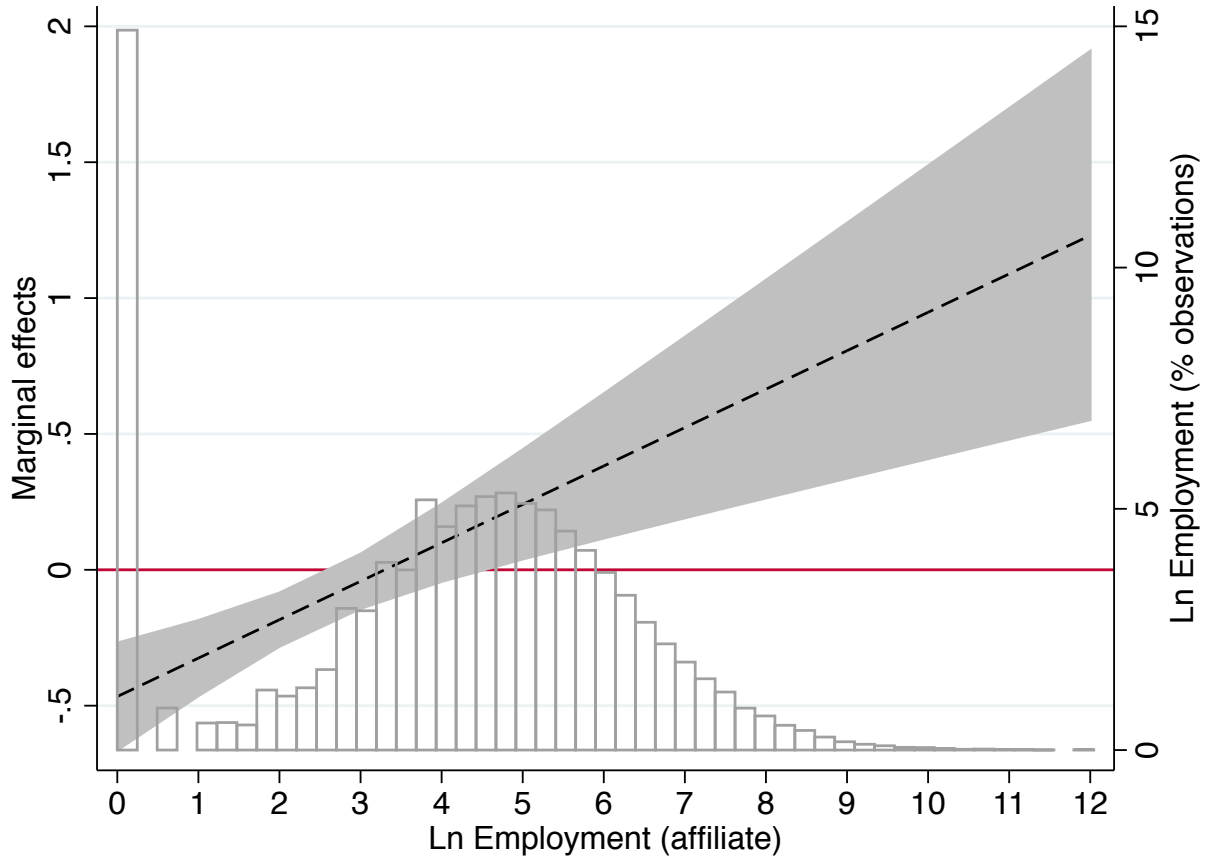
Note: The figure reports changes in the average affiliate sales shares to three destinations: local (sales to the host country), export-platform (sales to third countries), and vertical (sales to the U.S. parent company). The data are from the U.S. Bureau of Economic Analysis.

Figure 2: Mean Tariff Reductions in U.S. PTAs by Product Use



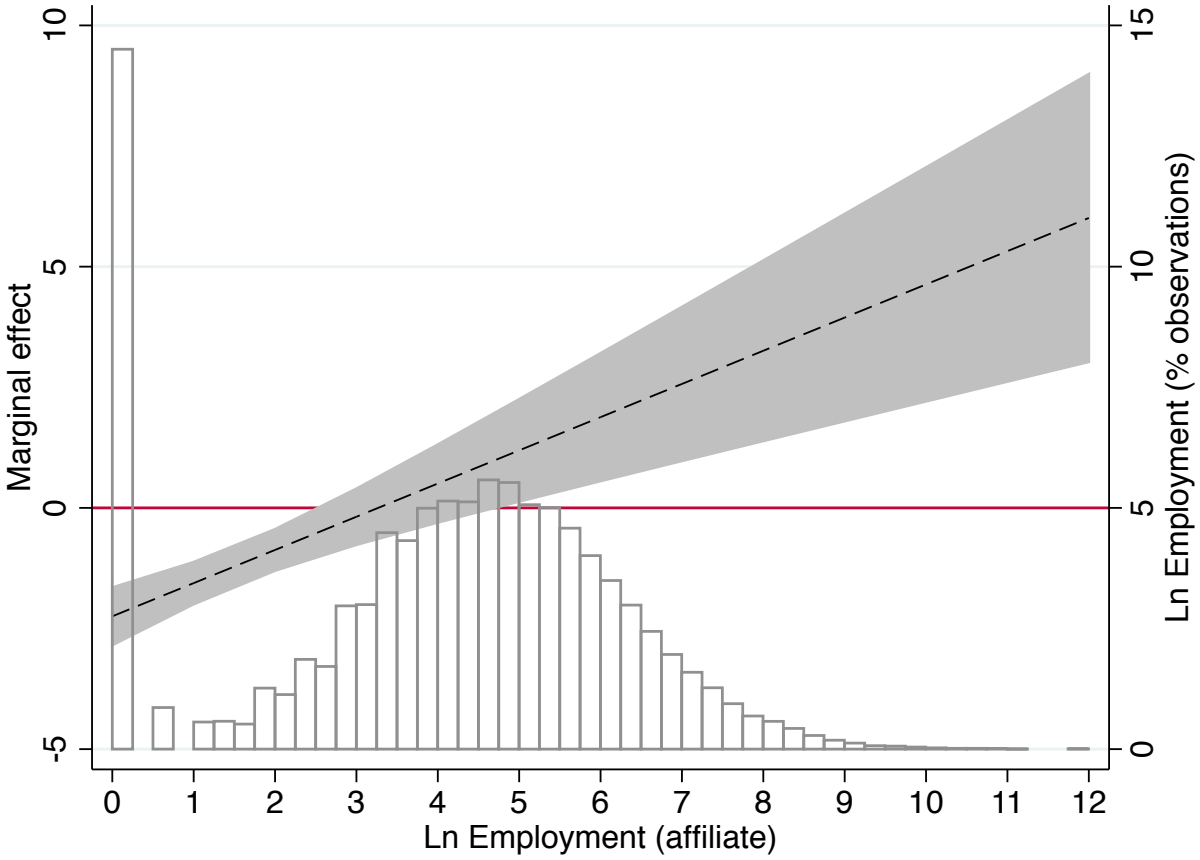
Note: The figure displays the differences between MNF tariffs prior to the formation of PTAs and preferential tariffs (PRF) after a PTA is in force by type of product classified as intermediate or consumption and mixed use. The categorization of products come from Francois and Pindyuk (2012) and Bekkers et al. (2012). The whiskers represent 90% confidence intervals.

Figure 3: Marginal Effect of PTA with U.S. on Vertical Sales by Firm Size



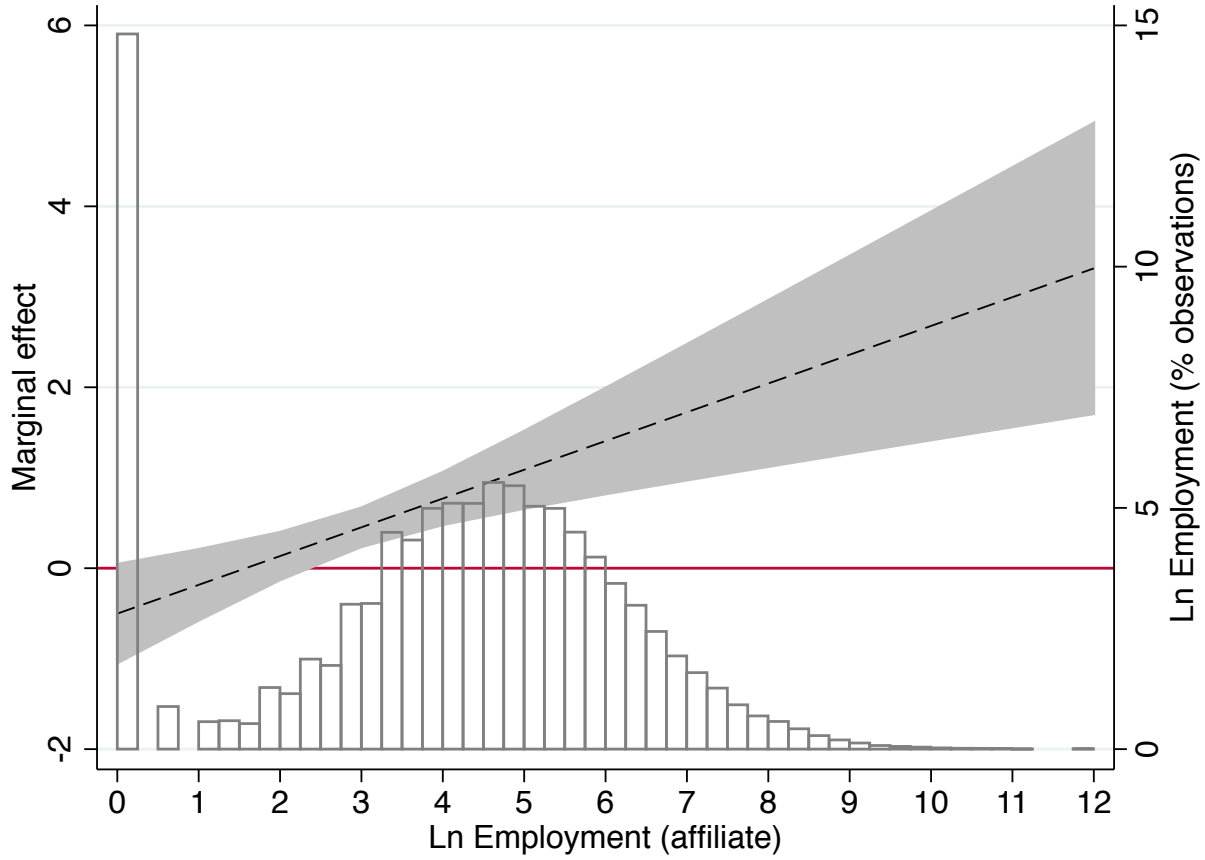
Note: Marginal effects (and 90% confidence intervals) of PTA with the U.S. on affiliate sales to the U.S., based on results from Column 3 in Table 2. See Tables 2, A.16, and text for description of the variables.

Figure 4: Marginal Effect of U.S. Preferential Tariff Cuts on Vertical Sales by Firm Size



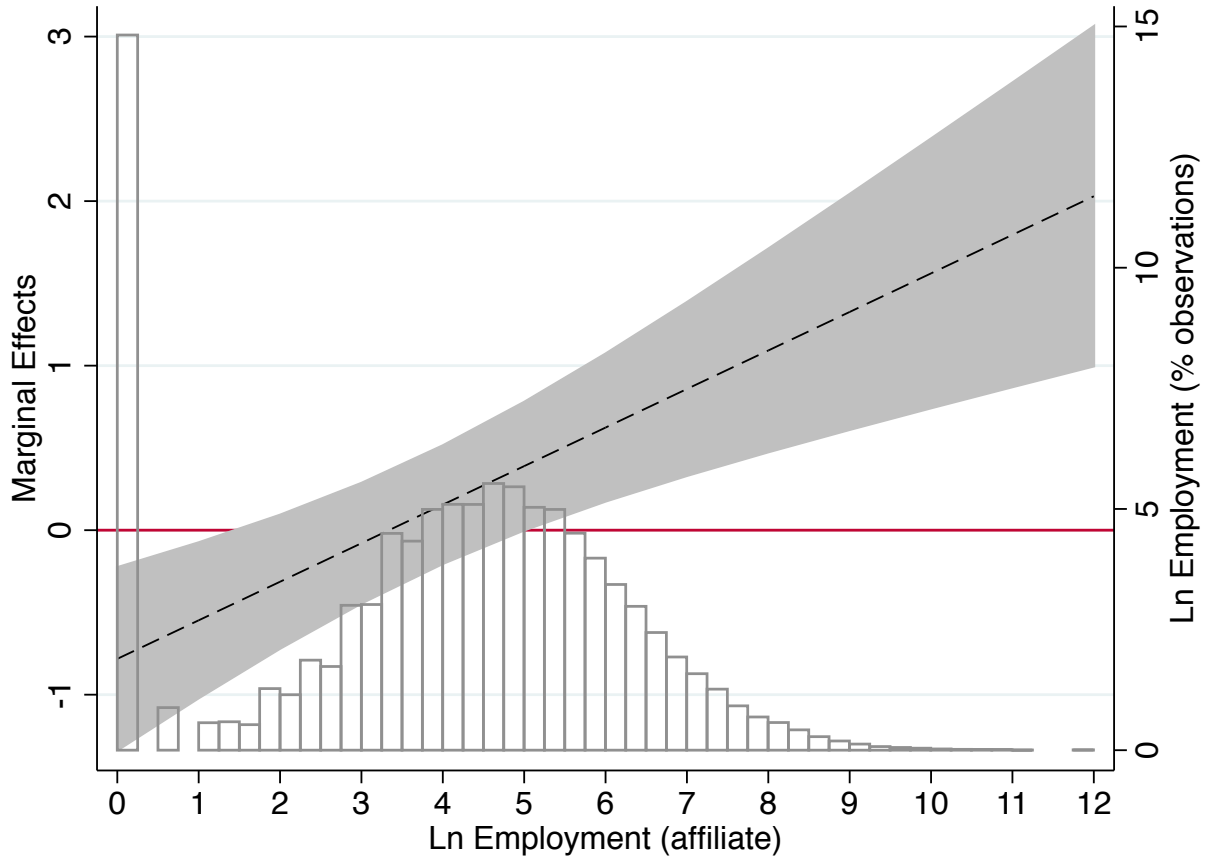
Note: Marginal effects (and 90% confidence intervals) of U.S. PTA cuts based on results from Column 6 in Table 2.

Figure 5: Marginal Effect of Host Country PTA Tariff Cuts on Export-Platform Sales by Firm Size



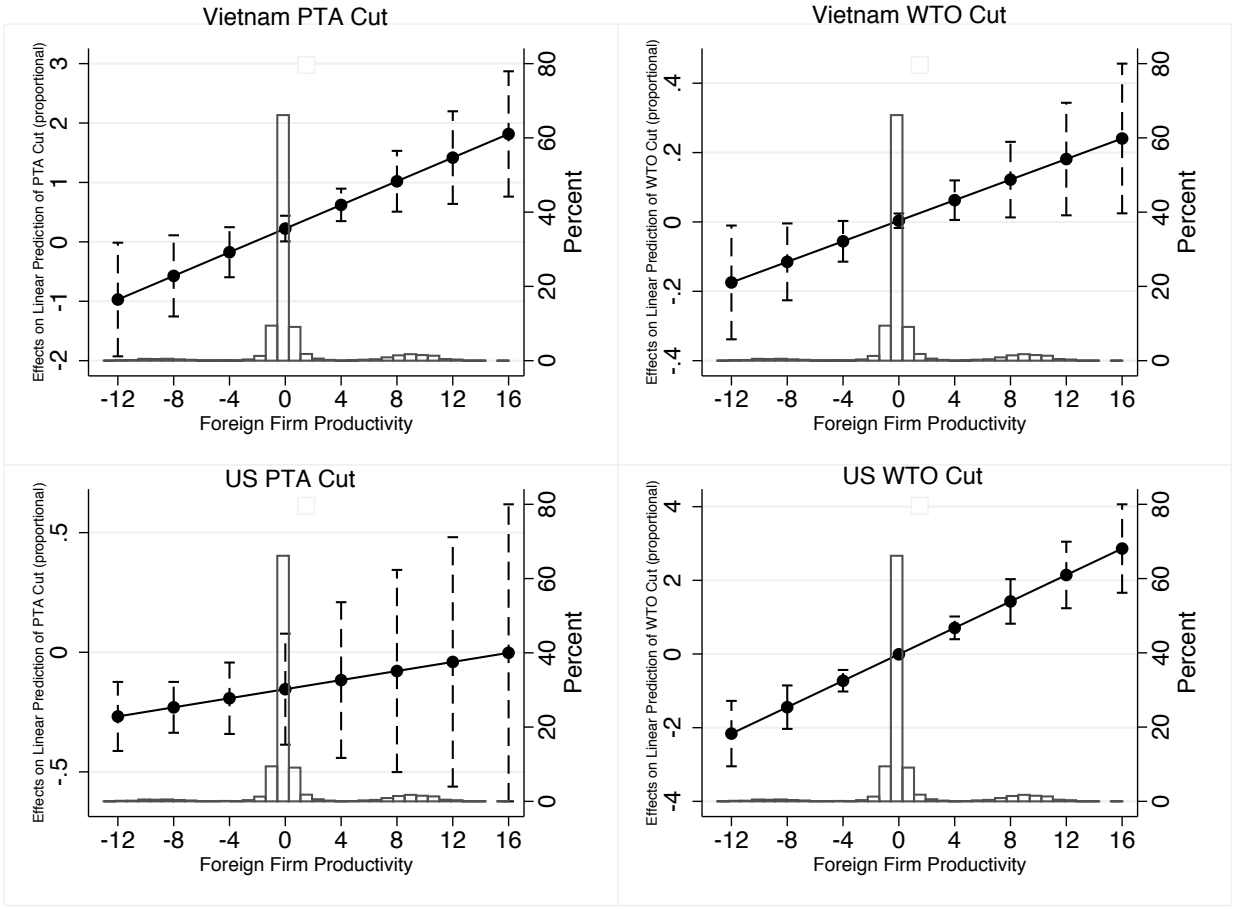
Note: Marginal effects (and 90% confidence intervals) of host country PTA cuts on affiliate sales to third markets based on results from Column 4 in Table 3.

Figure 6: Marginal Effect of Host Country MFN Tariff Cuts on Export-Platform Sales by Firm Size



Note: Marginal effects (and 90% confidence intervals) of host country MFN cuts on affiliate sales to third markets based on results from Column 7 in Table 3.

Figure 7: Marginal Effect of Changes in Tariffs on Changes in Sales HHI in Vietnam



Note: Marginal effects (and 90% confidence intervals) based on results from Table A.2.

Table 1: The Effect of Preferential and Multilateral Liberalization on Trade-Related Activities

Type of activity	**PTA x Productivity**	**WTO x Productivity**
Vertical FDI	Positive (strong) effect through discriminatory tariff cuts implemented by the U.S. (**H1**)	Positive (weak) effect through non-discriminatory tariff cuts implemented by the U.S. (**H2**)
Export-Platform FDI	Positive (strong) effect through discriminatory tariff cuts implemented by partner country (**H1**)	Positive (weak) effect through non-discriminatory tariff cuts implemented by partner country (**H2**)

Table 2: International Trade Agreements and U.S. MNC Affiliate Vertical Sales, 1989-2009 Benchmarks (Affiliate-level)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Vertical Sales	Vertical Sales	Vertical Sales	Vertical Sales	Vertical Sales	Vertical Sales	Vertical Sales	Vertical Sales	Vertical Sales
Ln GDP/capita	0.307	0.201	0.211	0.193	0.050	0.081	0.051		
	(0.223)	(0.184)	(0.183)	(0.190)	(0.325)	(0.307)	(0.323)		
GATT only	0.376*	0.270	0.283*	0.256	0.168	0.177	0.166		
	(0.198)	(0.169)	(0.168)	(0.177)	(0.153)	(0.147)	(0.154)		
WTO member (partner)	0.268	0.204	0.202	0.524*					
	(0.258)	(0.245)	(0.243)	(0.289)					
BIT with US	0.271**	0.231**	0.227**	0.235**	0.144	0.145	0.142		
	(0.135)	(0.105)	(0.106)	(0.102)	(0.127)	(0.125)	(0.127)		
Ln Cumulative PTAs (partner)	0.048	0.021	0.021	0.023	-0.003	-0.001	-0.002		
	(0.031)	(0.026)	(0.027)	(0.026)	(0.046)	(0.043)	(0.046)		
PTA with US	0.154	0.120	-0.466***	0.131					
	(0.107)	(0.097)	(0.120)	(0.099)					
Ln Employment (affiliate)		0.484***	0.458***	0.534***	0.500***	0.480***	0.501***	0.480***	0.509***
		(0.021)	(0.023)	(0.033)	(0.032)	(0.022)	(0.032)	(0.022)	(0.026)
PTA x Ln Employment			0.141***						
			(0.043)						
WTO x Ln Employment				-0.070***					
				(0.024)					
WTO Cuts (US)					0.548*	0.547*	1.093	0.046	
					(0.296)	(0.289)	(0.830)	(0.221)	
PTA Tariff Cuts (US)					1.088	-2.248***	1.088	-3.735***	
					(0.715)	(0.362)	(0.715)	(0.959)	
PTA Tariff Cuts (US)						0.688***		0.637***	0.627***
x Ln Employment						(0.172)		(0.183)	(0.165)
WTO Cuts (US) x							-0.100		
x Ln Employment							(0.118)		
Observations	82946	82946	82946	82946	73736	73736	73736	73736	73736
R-squared	0.0471	0.106	0.107	0.106	0.114	0.117	0.114	0.194	0.0739
Countries	165	165	165	165	163	163	163	163	163

Models (1)-(7) include year, industry and country fixed effects. Model (8) includes country/year fixed effects, and industry specific time trends. Model (9) includes industry/country/year fixed effects.

Note: The dependent variable is the log of total affiliate sales to the U.S. based on affiliate-level data from the BEA. Robust standard errors adjusted for country-level clustering. All models include country, year, and industry fixed effects. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 3: International Trade Agreements and U.S. MNC Affiliate Export Platform Sales, 1989-2009 Benchmarks (Affiliate-level)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Export Platform Sales	Export Platform Sales	Export Platform Sales	Export Platform Sales	Export Platform Sales	Export Platform Sales	Export Platform Sales	Export Platform Sales	Export Platform Sales
Ln GDP/capita	-0.630**	-0.560*	-0.337	-0.339	-0.335	-0.535	-0.531		
	(0.299)	(0.320)	(0.258)	(0.258)	(0.258)	(0.325)	(0.325)		
GATT only	0.610***	0.601***	0.545***	0.546***	0.548***	0.444***	0.448***		
	(0.180)	(0.164)	(0.157)	(0.156)	(0.157)	(0.154)	(0.153)		
WTO member (partner)	0.550**	0.747**							
	(0.263)	(0.309)							
BIT with US	0.344	0.339	0.528**	0.527**	0.529**	0.375	0.376		
	(0.272)	(0.258)	(0.248)	(0.248)	(0.247)	(0.243)	(0.243)		
Ln Cumulative PTAs (partner)	0.221***	0.192**	0.196***	0.196***	0.196***	0.200**	0.199**		
	(0.078)	(0.083)	(0.070)	(0.070)	(0.069)	(0.083)	(0.083)		
PTA with US	1.733***								
	(0.308)								
Ln Employment (affiliate)	0.631***	0.613***	0.636***	0.634***	0.634***	0.578***	0.577***	0.574***	0.604***
	(0.035)	(0.047)	(0.036)	(0.036)	(0.037)	(0.042)	(0.042)	(0.043)	-0.048
PTA x Ln Employment	-0.297***								
	(0.053)								
WTO x Ln Employment		-0.048**							
		(0.022)							
WTO Cuts (partner)			0.530**	0.531**	-0.762**	0.992**	-0.835***	-1.369***	
			(0.259)	(0.259)	(0.338)	(0.396)	(0.308)	(0.269)	
PTA Tariff Cuts (partner)			1.095***	-0.483	1.094***				
			(0.281)	(0.329)	(0.281)				
PTA Tariff Cuts (partner)				0.313***					
x Ln Employment				(0.105)					
WTO Cuts (partner)					0.226***		0.319***	0.335***	0.200**
x Ln Employment					(0.071)		(0.075)	(0.075)	-0.088
Observations	82946	82946	71162	71162	71162	82931	82931	82931	82931
R-squared	0.157	0.153	0.146	0.146	0.146	0.153	0.153	0.252	0.069
Countries	165	165	163	163	163	165	165	165	165

Models (1)-(7) include year, industry and country fixed effects. Model (8) includes country/year fixed effects, and industry specific time trends. Model (9) includes industry/country/year fixed effects.

Note: The dependent variable is the log of total affiliate sales to third countries based on affiliate-level data from the BEA. Robust standard errors adjusted for country-level clustering. All models include country, year, and industry fixed effects. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 4: Concentration of Employment and Sales: Regression Analysis

Dependent Variable	Herfindahl-Hirschman Index (Employment)				Herfindahl-Hirschman Index (Sales)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PTA with US	0.030***	0.028**			0.029**	0.027**		
	(0.011)	(0.011)			(0.013)	(0.013)		
PTA Tariff Cuts			0.038*				0.038**	
			(0.022)				(0.017)	
WTO		0.051*				0.040*		
		(0.027)				(0.021)		
WTO Tariff Cuts				-0.152				-0.246***
				(0.093)				(0.075)
GATT Only		-0.042*				-0.035		
		(0.024)				(0.027)		
BIT with US		-0.068***				-0.030*		
		(0.020)				(0.018)		
Ln (GDP/capita)	-0.121***	-0.133***	-0.119***	-0.108***	-0.136***	-0.144***	-0.139***	-0.118***
	(0.040)	(0.031)	(0.042)	(0.035)	(0.048)	(0.040)	(0.049)	(0.040)
Ln (population)	0.002	0.045	0.005	0.009	0.080	0.112**	0.085	0.084
	(0.051)	(0.051)	(0.054)	(0.052)	(0.052)	(0.055)	(0.054)	(0.052)
Observations	19770	19770	18005	19764	19770	19770	18005	19764
Countries	169	169	167	169	169	169	167	169
R-squared	0.311	0.312	0.316	0.311	0.442	0.445	0.439	0.443
Fixed effects	Industry, Country, Year	Industry, Country, Year	Industry, Country, Year	Industry, Country, Year	Industry, Country, Year	Industry, Country, Year	Industry, Country, Year	Industry, Country, Year
Unit of analysis	Industry-country-year	Industry-country-year	Industry-country-year	Industry-country-year	Industry-country-year	Industry-country-year	Industry-country-year	Industry-country-year

Note: The dependent variables are Herfindahl-Hirschman Indices of Employment and Sales among affiliates of U.S. MNCs. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Appendix A Bureau of Economic Analysis (BEA) Data on U.S. Multinational Companies

The statistical analysis of firm-level data on U.S. multinational companies was conducted at the Bureau of Economic Analysis, U.S. Department of Commerce, under arrangements that maintain legal confidentiality requirements. Given legal constraints, the data must be analyzed on site at the BEA and cannot be put on any website. Nevertheless, these data can be accessed by special sworn researchers; at the present time there are dozens of researchers with access to the data. Here is a list of articles and working papers produced by academic researchers using BEA data: `http://www.bea.gov/papers/SSE_papers.htm`.

The following is a description of the BEA special sworn employee program:

> Recognizing that some research requires data at a more detailed level than that provided in its publicly disseminated tabulations, the International Economics Directorate of the Bureau of Economic Analysis maintains a program that permits outside researchers to work on site as unpaid special sworn employees of the Bureau for the purpose of conducting analytical and statistical studies using the microdata on multinational companies and international service transactions it collects under the International Investment and Trade in Services Survey Act.
>
> This work is conducted under strict guidelines and procedures that protect the confidentiality of company-specific data, as required by law. Because the program exists for the express purpose of advancing scientific knowledge and because of legal requirements that limit the use of the data to analytical and statistical purposes, appointment to special-sworn-employee status under this program is limited to researchers. Appointments are not extended to any persons affiliated with organizations that collect taxes, enforce regulations, or make policy. Questions about BEA's program for outside researchers can be addressed to William Zeile at william.zeile@bea.gov. [Source: `http://www.bea.gov/about/research_program.htm`]

The ability to replicate our results is ensured because our program files and the data sets used to generate the results are available in a directory at the BEA that is accessible to all of the special sworn researchers at the BEA. Once access has been arranged, all special sworn employees can obtain the data and the STATA code used to manipulate the data at the BEA.

The data include detailed financial and operating information at the level of the foreign affiliate and the U.S. parent. The affiliate sales information used in this study was extracted from the BEA's data files for each benchmark survey year, then merged with the parent firm information to create a complete parent-affiliate-year panel. The sample includes all majority-owned affiliates; we exclude values: (1) that were imputed based on previous survey responses; (2) from firms in the financial sector; or (3) that correspond to a form rejected by the BEA due to inaccuracies.

Any U.S. person with direct or indirect ownership of 10% or more of the voting securities of a foreign business during the benchmark fiscal year is a U.S. parent of the foreign business, which is termed its foreign affiliate. The U.S. multinational is the combination of the U.S. legal entity that has established or purchased the affiliate (i.e., the U.S. 'parent') and at least one foreign business enterprise (i.e., the foreign 'affiliate'). The International Investment and Trade in Services Survey Act requires that owners of foreign affiliates detail the balance sheets, income statements, and international transactions of their affiliates. As a result of the confidentiality assurances and

the penalties for non-compliance, the coverage is considered nearly complete and the accuracy of the responses is high.

The analysis relies primarily on affiliate-level sales data (disaggregated according to the destination of the buyer) from the quinquennial Benchmark Surveys. The benchmark years are 1989, 1994, 1999, 2004, and 2009. We characterize horizontal sales as those to the host country; vertical sales are sales to the United States, and export-platform sales are directed to other countries.

In Tables A.12 and A.13 we interact PTAs with a measure of firm productivity. Following Bilir (2014), productivity is measured at the parent firm level based on a simple Solow residual, which we calculate for each parent firm-year by regressing the firm-level log of value added on firm-level physical assets, employment, and industry and year dummies. The residuals of this regression are our time-varying measures of firm productivity.

Appendix B Tariff Data

Data on MFN and preferential tariffs come from WITS (2014) and rely on Harmonized System (HS) trade categorization. U.S. HS codes are established by the World Customs Organization (WCO). The WCO assigns 6-digit codes for general categories, and countries adopting the system then define their own codes to capture commodities at more detailed levels. In the United States, the most detailed level of disaggregation is ten digits by Pierce and Schott (2012). Since the U.S. HS system is rooted in WCO 6-digit HS, we construct concordance between 6-digit HS combined and 4-digit NAICS from 1996 to 2009 using two steps. First, based on concordance between 10-digit U.S. HS and 7-digit NAICS provided by Pierce and Schott (2012), we construct the concordance between 6-digit U.S. HS and 4-digit NACIS. Second, we use WITS concordances between HS combined and other HS systems (H1, H2, and H3) to match 6-digit U.S. HS codes over time.

Appendix C Country-level Results

Our main tests of Hypotheses 1-4 seek to estimate the effects of the level of tariff cuts resulting from MFN and preferential liberalization on vertical and export-platform sales at the firm level. However, since previous studies have found that PTAs increase aggregate FDI (Büthe and Milner, 2008, 2014), we begin our analysis at the country level using aggregated BEA data. The purpose of the country-level analysis is to examine the relationship between PTAs (and WTO) and MNC activity, ignoring all sectoral and firm-level sources of variation.

We begin with models of the counts of total affiliates and counts of each type of affiliates (horizontal, export-platform, and vertical) in each country-benchmark year. We also estimate models of total sales for each type of activity at the country level. The models take the following form:

$$A_{it} = \alpha\ PTA\ with\ US_{it} + \beta\ WTO_{it} + \gamma C_{it} + \varsigma_i + \tau_t + \epsilon_{it} \tag{1}$$

where A_{it} is either the log of the number of total affiliates or the log of total affiliate sales aggregated to the country i level in benchmark year t.[50] *PTA with US*$_{it}$ and WTO capture the existence of a PTA with the United States and WTO membership, respectively, C_{it} are the economic and political control variables (including other international economic agreements), and ς_i and τ_t are country and year fixed effects, respectively. The models are estimated using OLS and standard errors are clustered at the country level. The expectation from the extant literature is that PTAs should promote investment, which is reflected in a positive coefficient corresponding to *PTA with US*$_{it}$.

We report the estimates of the number of U.S. company foreign affiliates on the left-hand panel of Table A.1. The dependent variable in Column 1 is the total number of affiliates in each country-benchmark year, while Columns 2-4 break down the number of affiliates by the type of activity.[51] The results indicate that PTAs with the United States are not associated with the number of affiliates. PTAs with the United States are, however, associated with higher horizontal and vertical sales at the 90% confidence level. The results in Column 8 indicate that a PTA with the United States is associated with a large increase in exports to the United States: on average, a PTA with the United States increases horizontal and vertical sales by 65% and 170%, respectively. WTO membership does not seem to be associated with MNC activity in any of the count or sales models; similar results pertain to the GATT. Finally, signing a BIT with the United States is positively associated with more affiliates and greater sales, yet the coefficient is only statistically significant for total sales and horizontal sales.[52]

The only systematic relationship unveiled by the country-level results is the positive association between the cumulative number of PTAs entered into by the host country and aggregate affiliate activities, including the total number of affiliates and total affiliate sales. This result is consistent with Büthe and Milner (2008, 2014). The substantive effect is not trivial: a 10% increase in cumulative PTAs is associated with a nearly 2% increase in the number of affiliates. As shown in Columns 2 and 3, total PTAs are also strongly associated with the number of horizontal affiliates and with export-platform affiliates. Yet we find that cumulative PTAs are associated with smaller increases in the number of vertical affiliates. There is also an association between cumulative PTAs and the aggregate sales of U.S. MNCs. The relationship holds for horizontal and export sales, but there is no evidence that cumulative PTAs increase vertical sales back to the United States.

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[50] We add one to the count and sales variable prior to taking the natural log to preserve country-year observations with no affiliate sales in the sample.

[51] he categories are not mutually exclusive. An affiliate with positive sales in a particular category (horizontal, vertical, and export-platform) is counted as an affiliate in that category.

[52] Column 1 also indicates a positive and statistically significant relationship between economic development and the logged number of U.S. MNC affiliates. A one-standard deviation increase in GDP per capita (equivalent to about a 19% increase) is associated with 9% more affiliates. We also find that trade openness is strongly positively associated with affiliate presence.

Table A.1: International Trade Agreements and U.S. MNC Activities (Country-level)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Affiliate Counts				Ln Aggregate Sales			
Dependent Variable	Total Affiliates	Horizontal Affiliates	Export-Platform Affiliates	Vertical Affiliates	Total Sales	Horizontal Sales	Export Platform Sales	Vertical Sales
Ln GDP/capita (partner)	0.517***	0.490***	0.216	0.479**	1.404*	1.364**	0.250	2.637**
	(0.187)	(0.170)	(0.177)	(0.211)	(0.802)	(0.643)	(1.023)	(1.172)
GDP growth (partner)	0.004	0.004	0.010	0.009	0.016	0.011	0.065	0.111***
	(0.007)	(0.006)	(0.007)	(0.006)	(0.038)	(0.035)	(0.051)	(0.038)
Ln Population (partner)	-0.295	-0.292	-0.034	-0.224	0.578	0.234	1.655	-1.170
	(0.319)	(0.296)	(0.277)	(0.273)	(1.822)	(1.740)	(1.995)	(1.695)
Political Constraints (partner)	0.141	0.176	0.009	-0.082	-0.212	0.115	0.066	0.285
	(0.225)	(0.215)	(0.219)	(0.200)	(1.115)	(1.115)	(1.291)	(1.341)
Political Instability	-0.043*	-0.042	-0.044	-0.062*	-0.039	-0.050	-0.114	-0.131
	(0.026)	(0.026)	(0.031)	(0.035)	(0.079)	(0.076)	(0.088)	(0.147)
Trade/GDP	0.004**	0.004***	0.003**	0.003**	0.023***	0.023***	0.003	0.010
	(0.002)	(0.002)	(0.001)	(0.001)	(0.008)	(0.007)	(0.010)	(0.011)
GATT only (partner)	0.012	0.010	0.062	-0.087	0.258	0.285	0.370	-0.132
	(0.093)	(0.092)	(0.113)	(0.102)	(0.516)	(0.505)	(0.683)	(0.612)
WTO member (partner)	0.006	0.039	-0.050	-0.048	-0.859	-0.262	0.585	-0.558
	(0.113)	(0.106)	(0.120)	(0.088)	(0.803)	(0.817)	(0.914)	(0.725)
BIT with US	0.069	0.045	0.059	0.056	1.238*	1.318**	0.861	0.465
	(0.120)	(0.113)	(0.141)	(0.117)	(0.633)	(0.594)	(0.968)	(0.701)
PTA with US	-0.079	-0.050	0.041	0.020	0.472	0.503*	0.751	0.995*
	(0.092)	(0.098)	(0.099)	(0.106)	(0.310)	(0.292)	(0.746)	(0.538)
Ln Cumulative PTAs (partner)	0.203***	0.214***	0.173**	0.103*	0.985***	0.809**	0.982**	0.406
	(0.071)	(0.067)	(0.082)	(0.059)	(0.351)	(0.322)	(0.472)	(0.324)
Country FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Observations	772	772	772	772	772	772	772	772
R-squared	0.974	0.976	0.962	0.964	0.886	0.879	0.849	0.865
Countries	169	169	169	169	169	169	169	169

Note: The dependent variables are the logged sum of total affiliates and the logged sum of total affiliate sales in each country-year based on affiliate-level data from the BEA. All models include country and year fixed effects. Robust standard errors adjusted for country-level clustering. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Together these results suggest that preferential liberalization (through PTAs) and MFN liberalization relate to U.S. MNC activity in different ways: contrary to expectations, the number of PTAs signed by the host country is not systematically associated with higher FDI in all types of activities, which might be expected if participation in these agreements were to provide reassurances to investors. The positive and significant relationship between cumulative PTAs and sales by U.S. MNC affiliates to the local market is consistent with credible commitment arguments[53], while the (lack of) effect on vertical activities is not. Signing bilateral agreements with the United States (PTAs or BITs) or participating in multilateral agreements provides less conclusive results at the country level. Note, however, that the degree of aggregation of the data in these country-level analyses is not ideal for probing our hypotheses. Instead, in the ensuing empirical analysis we will rely on firm-level sales data disaggregated by activity, and fine-grained data on the tariff cuts resulting from MFN or PTAs.

[53]The positive relationship between cumulative PTAs and export-platform sales could be the result of credibility or lower tariffs abroad

Appendix D Evidence from Vietnam

Data: Data comes from the GSO of Vietnam, and includes the annual census of Vietnamese firms and a large number of firm-level variables. Data are originally in Vietnamese and have been translated into English.

Dependent Variables: In the main analysis we rely on market concentration calculated on firms' revenue at the industry level using the HHI. Firms' revenue includes the revenues of private firms, SOEs, and foreign firms. As a robustness check, we also use market concentration calculated based on the number of employees.

Independent Variables: Productivity is computed as firm-level Solow residuals. Specifically, we regress the firm-level log of revenue on firm-level physical assets and employment. The residuals of this regression are our time-varying measures of firm productivity. To obtain foreign firms' productivity, we calculated the average productivity of foreign firms at the industry level. We discussed in the text how we obtained PRF Cut (proportional) and MFN Cut (proportional).

Control Variables: the share of revenue of foreign and private firms is calculated using their average values at the industry level. Size is the average value of (the log of) the number of employees at the industry level, including every type of firm (i.e., private firms, SOEs, and foreign firms). Capital is the mean of (the log of) the value of assets at the industry level, including every type of firm. The number of SOEs and private firms is a simple count variable summing up all the private firms and SOEs operating in each industry.

Since we have yearly data, we are able to estimate both the short- and long-term effects of PTAs and the WTO on domestic market concentration. This is important for our purpose, since—according to BEA data—we have found that ITAs have a short-term effect on the market concentration of U.S. affiliates. Thus, we aim to confirm such a short-term effect of PTAs and the WTO on domestic market concentration by estimating an error-correction model (ECM) in which the dependent variable is the first-differences of HHI (revenues). In this model, each explanatory variable appears on the right-hand side with both first-differences and lagged values. The ECM also includes the lagged dependent, the coefficient of which should be negative to meet the stationary condition.[54] Formally, we estimate the following ECM model:

$$\begin{aligned}\Delta HHI_{i,t} = {} & \beta_1 \Delta TariffCut_{i,t} + \beta_2 \Delta ForeignTFP_{i,t} + \beta_3 \Delta TariffCut_{i,t} \times \Delta ForeignTFP_{i,t} + \\ & \beta_4 TariffCut_{i,t-1} + \beta_5 ForeignTFP_{i,t-1} + \beta_6 TariffCut_{i,t-1} \times ForeignTFP_{i,t-1} + \\ & \beta_7 \Delta X_{i,t} + \beta_8 X_{i,t-1} + \eta_{i,t}\end{aligned} \tag{2}$$

Armed with such an empirical specification and research design, we estimate several models (Table A.2). In the two first models we include PTA cut (proportional) implemented by Vietnam and its interaction with foreign firms' productivity (TFP) with and without control variables. In Models 3 and 4 we include MFN cut (proportional) implemented by Vietnam and its interaction with foreign firms' productivity, respectively, with and without control variables. In Models 5 and 6 we include PRF cut (proportional) implemented by the United States and its interaction with foreign firms' productivity, respectively, with and without control variables. In Models 7 and 8

[54] Using an ECM is in line with Büthe and Milner (2008), and allows us to properly account for the non-stationary time series data (Boef and Keele, 2008).

we include MFN cut (proportional) implemented by the United States and its interaction with foreign firms' productivity, respectively, with and without control variables. In models in which we estimate the effect of MFN cuts, we also control for preferential tariffs, since the U.S. PTA was formed before Vietnam's accession to the WTO.

Table A.2: HHI Sales Concentration and Trade Liberalization in Vietnam: Error Correction models

	(1) ΔHHI	(2) ΔHHI	(3) ΔHHI	(4) ΔHHI	(5) ΔHHI	(6) ΔHHI	(7) ΔHHI	(8) ΔHHI
HHI lagged	-0.398***	-0.383***	-0.338***	-0.345***	-0.232***	-0.206**	-0.383***	-0.370***
	(0.023)	(0.024)	(0.017)	(0.018)	(0.080)	(0.085)	(0.022)	(0.022)
Δ Productivity (foreign firm)	-0.008***	-0.011***	-0.006***	-0.008***	-0.004	-0.005	-0.008***	-0.010***
	(0.002)	(0.002)	(0.001)	(0.001)	(0.009)	(0.008)	(0.002)	(0.002)
Δ PTA cuts (prop.)	0.234**	0.225*		0.089**	-0.160	-0.153		
	(0.109)	(0.132)		(0.042)	(0.178)	(0.137)		
Δ PTA cuts (prop.) x	0.102***	0.101**			0.002	0.006		
Productivity (foreign firm)	(0.036)	(0.044)			(0.021)	(0.016)		
Productivity (foreign firm) lagged	-0.007***	-0.010***	-0.005***	-0.008***	-0.092***	-0.062*	-0.006***	-0.009***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.029)	(0.034)	(0.001)	(0.001)
PRF cut (prop.) lagged	0.021	0.006		0.035	-0.732***	-0.589*		
	(0.048)	(0.053)		(0.028)	(0.227)	(0.313)		
PRF cut (prop.) x	0.002	0.001			0.091***	0.063*		
Productivity (foreign firm)	(0.005)	(0.005)			(0.028)	(0.034)		
Δ WTO cuts (prop.)			-0.001	0.004			-0.048**	-0.026
			(0.011)	(0.013)			(0.021)	(0.022)
Δ WTO cuts (prop.) x			0.007	0.009			0.011	0.025
Productivity (foreign firm)			(0.007)	(0.007)			(0.018)	(0.019)
WTO cuts (prop.) lagged			-0.025	-0.037			-0.053	0.073
			(0.024)	(0.025)			(0.134)	(0.125)
WTO cuts (prop.) x			0.002	0.001			-0.001	-0.011
Productivity (foreign firm)			(0.003)	(0.003)			(0.014)	(0.013)
Constant	0.133***	0.075	0.102***	0.123***	0.783***	0.181	0.127***	0.046
	(0.011)	(0.147)	(0.008)	(0.039)	(0.247)	(0.514)	(0.011)	(0.059)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	2,094	2,013	3,808	3,716	219	219	2,463	2,382
R-squared	0.237	0.230	0.201	0.206	0.205	0.449	0.226	0.220

Note: The dependent variable is the change in Herfindahl-Hirschman Index of Sales Concentration in Vietnam. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Appendix E Additional Robustness Checks

E.1 Instrumental Variables Estimation

The results thus far indicate that tariff cuts increase affiliates' sales to the home market. However, if time-varying firm-level characteristics are correlated with affiliate sales and tariff cuts, our models would not be correctly identified and our estimates would be biased. In other words, there is the possibility that tariff cuts are endogenous to affiliate sales despite our best efforts to control for unobserved firm-, industry-, and country-level heterogeneity through a battery of fixed effects. While it is perhaps unlikely that any single individual foreign affiliate of a U.S. MNC would influence the choice of entering preferential or multilateral agreements, any such influence could bias our estimates upward. Note that since we find an association between tariff cuts and sales of intermediate goods, concerns about reverse causality are assuaged somewhat. Indeed, should tariff cuts

be endogenous to sales, the relationship should hold for both intermediates and finished goods. In any case, in this section we further address concerns about endogeneity, relying on an instrumental variable (IV) approach.[55]

Our identification strategy follows Cheng (2012). In particular, to instrument for U.S. PTA cuts, we use tariff cuts implemented by other countries that form PTAs with the same U.S. PTA partner. For instance, we use tariff cuts implemented by Canada as a result of its PTA with Costa Rica to instrument for tariff cuts implemented by the United States in its PTA with Costa Rica. The intuition is that the United States tries to negotiate the same (preferential) tariff deal agreed by other countries that compete in the same markets in order to level the playing field with potential competitors. We include PTAs negotiated either concurrently with or prior to the U.S. PTAs.[56] We label the instrument *Competitor Cut*.

We are able to instrument only a subsample of the PTAs formed by the United States for three reasons. First, we are unable to instrument the PTAs that had been signed but were not in force by 2009 (with the exception of the U.S.-Korea PTA), the last benchmark year in the BEA data. Second, we are unable to instrument Canada and Mexico since we do not have data on PTAs formed before the North American Free Trade Agreement.[57] Third, we are unable to instrument tariff cuts for some PTAs, since data for some developing countries are not available, or are only very sparsely available, from WITS. We are left with six instrumented PTAs: Australia, Chile, Costa Rica, Peru, Singapore, and South Korea. (For the full list of instrumented PTAs and their instruments, see Table A.3.)

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[55]Ours is not the first study to recognize that trade liberalization could be endogenous to firm-level characteristics (Trefler, 1993; Goldberg and Pavcnik, 2005). Trefler (1993) uses industry characteristics such as market concentration to instrument for non-tariff barriers. This approach has been followed by other studies (Trefler, 2004; Amiti and Konings, 2007). Goldberg and Pavcnik (2005) use the level of tariffs that is in place before trade liberalization as an instrument of tariff cuts. Both approaches share the same problem: the instruments are correlated with tariffs and the outcome variables, and therefore likely violate the exclusion restriction. An advantage of our approach over existing studies is that we examine sales at the affiliate level, which allows us to include a battery of fixed effects to control for unobserved sources of variation.

[56]Before starting negotiations, trade partners establish a joint study group composed of high-level officials and experts from both sides. Such a group has the goal of assessing the potential for enhanced trade relations and suggesting tariff reductions in specific industries. When the joint study group ends its work, formal negotiations begin. In all the PTAs used as instruments, the establishment of joint study groups and informal and formal negotiations overlap with these of the PTAs instrumented. Also note that treaties can be amended between signature and ratification.

[57]Canada formed PTAs with Portugal and Spain in 1954, with Australia in 1960, and with New Zealand in 1980. None of them has been ratified by the WTO, and they are all inactive except the PTA with Australia. Mexico formed several PTAs with other Latin American countries in the 1980s. None of them has been ratified by the WTO, and they are now all inactive.

Table A.3: PTAs used to build our instrument used for IV Regressions

PTA Instrumented	Signature	Ratification	PTA used as instrument	Signature	Ratification
US-Australia	18 May 2004	1 January 2005	Thailand-Australia	5 July 2004	1 January 2005
US-Chile	6 June 2003	1 January 2004	South Korea-Chile	15 February 2003	1 April 2004
US-South Korea	30 June 2007*	15 March 2012	India-South Korea	7 August 2009	1 January 2010
US-Costa Rica	5 August 2004	1 January 2009	Canada-Costa Rica	23 April 2001	1 November 2002
US-Peru	12 April 2006**	1 February 2009	Canada-Peru	29 May 2008	1 August 2009
US-Singapore	6 May 2003	1 January 2004	Japan-Singapore	13 January 2002	30 November 2002

* Amended on December 3, 2010.

** Ratified with amendments on February 1, 2009.

Since our key variable is the interaction between tariff cuts and productivity, we also need to instrument this interaction term. Following previous studies (Park et al., 2010), we use the interaction between *Competitor Cut* and our measures of productivity, i.e. number of employees and assets (PPE), to instrument for the interaction term in our main regressions. More formally, we estimate two stages (Wooldridge, 2012). The first-stage models are the following:

$$\begin{aligned} Cut_{ij,t-1} = \beta_1 Comp.\ Cut_{ij,t-1} + \beta_2 Prod_{ij,t-1} + \beta_3 Comp\ Cut_{ij,t-1} \times Prod_{ij,t-1} + \beta_4 X_{j,t-1} + \\ + \varphi_j + \varsigma_i + \tau_{t-1} + \eta_{ij,t-1} \end{aligned} \tag{3}$$

$$\begin{aligned} Cut_{ij,t-1} \times Prod_{ij,t-1} = \beta_1 Comp\ Cut_{ij,t-1} + \beta_2 Prod_{ij,t-1} + \beta_3 Comp\ Cut_{ij,t-1} \times Prod_{ij,t-1} + \\ + \beta_4 X_{j,t-1} + \varphi_j + \varsigma_i + \tau_{t-1} + \zeta_{ij,t-1} \end{aligned} \tag{4}$$

The second-stage model is:

$$S_{ij,t} = \beta_1 \widehat{Cut}_{ij,t-1} + \beta_2 Prod_{ij,t-1} + \beta_3 \widehat{Cut \times Prod}_{ij,t-1} + \beta_4 X_{j,t-1} + \varphi_j + \varsigma_i + \tau_{t-1} + \epsilon_{ij,t-1} \tag{5}$$

Armed with our instruments, our identification strategy is sound if three conditions are satisfied. First, tariff cuts implemented by competitors should not impact affiliate sales to the United States. Since vertical FDI is affected almost exclusively by the level of tariffs with the home country, such a possibility seems remote. However, it might be the case that PTAs formed by U.S. competitors increase the economic activities of the affiliates of firms from those competitors, which in turn raises the demand for labor and other inputs in the partner countries. Such increases in wages and input costs may also affect the sales of U.S. affiliates operating in these host countries by increasing the costs of production. To mitigate this concern, we select countries (1) that are relatively small and/or less developed than the United States (when data are available); (2) that negotiated PTAs at about the same time the United States did, so that any effects on the labor market have no time to materialize.[58] Table A.3 reports which PTAs we use to instrument *Competitor Cut*.

[58]In this spirit, we exclude EU PTAs from our instrument.

Second, our instruments have to be strong predictors of *Competitor Cut*. The correlation between our instrument and *Competitor Cut* is 0.45. All the diagnostics (reported in Table A.4) show that our instrument is strong, and that there are no concerns about under-identification.

Third, our instruments should not be correlated with (time-varying) industry characteristics. This might be the case if U.S. MFN tariffs (pre-PTA) are correlated with the MFN tariffs of U.S. competitors that form agreements with the same host markets. Indeed, the level of tariffs before the formation of a PTA may be a proxy for industry characteristics, which are in turn correlated with our outcome variable. Formally, $Cov(MFN_{US}, MFN_{USCompetitor}) = 0$. Indeed, the correlation between U.S. MFN and U.S. competitors' MFN is very low: $\rho = 0.08$.

Table A.4 reports the results of the IV estimations. Instrumenting tariff cuts implemented under a PTA signed with the United States by the cuts implemented by the partner with third countries yields results in line with those presented in Table 2: reciprocal liberalization through PTAs leads to lower vertical sales by smaller affiliates and higher sales by larger ones, irrespective of whether we measure size in terms of assets (Column 3) or employment (Column 6). In the IV estimation, the marginal effect of tariff cuts turns positive for firms with greater than $27,572 in PPE, or that employ more than 218 employees.

Table A.4: Preferential Cuts and U.S. MNC Affiliate Vertical Sales: IV Regression

	(1)	(2)	(3)	(4)	(5)	(6)
	First Stage		2nd Stage	First Stage		2nd Stage
Dependent Variable:	PTA Tariff Cuts (US)	PTA Tariff Cuts (US) x Ln Assets	Vertical Sales	PTA Tariff Cuts (US)	PTA Tariff Cuts (US) x Ln Empl.	Vertical Sales
Ln GDP/capita	0.002	0.023	0.412**	0.002	0.013	0.309*
	(0.009)	(0.087)	(0.189)	(0.009)	(0.046)	(0.167)
GATT only	-0.001	-0.011	0.300	-0.001	-0.007	0.318*
	(0.002)	(0.023)	(0.191)	(0.002)	(0.012)	(0.183)
WTO member (partner)	-0.001	-0.008	0.138	-0.001	-0.005	0.146
	(0.005)	(0.044)	(0.257)	(0.005)	(0.023)	(0.235)
BIT with US	-0.001	-0.006	0.135	-0.001	-0.003	0.183*
	(0.002)	(0.015)	(0.093)	(0.002)	(0.008)	(0.094)
Ln Cumulative PTAs	-0.003	-0.027	0.017	-0.003	-0.014	0.034
	(0.002)	(0.022)	(0.032)	(0.002)	(0.012)	(0.029)
Ln Assets (PPE, affiliate)	0.00003	0.0006*	0.242***			
	(0.00002)	(0.0004)	(0.013)			
Ln Employment (affiliate)				-0.00004	0.0002	0.475***
				(0.00005)	(0.0002)	(0.022)
Instruments						
Competitor Cut	0.901***	-0.123		0.907***	-0.294***	
	(0.048)	(0.227)		(0.072)	(0.065)	
Competitor Cut x Ln Assets	0.011*	1.024***				
	(0.006)	(0.123)				
Competitor Cut x Ln Employment				0.020***	1.077***	
				(0.007)	(0.106)	
Instrumented						
PTA Tariff Cuts (US)			-2.914***			-1.993***
			(0.349)			(0.664)
PTA Tariff Cuts (US) x Ln Assets			0.285***			
			(0.048)			
PTA Tariff Cuts (US) x Ln employment						0.370**
						(0.147)
Observations	68444	68444	68444	68444	68444	68444
Countries	150	150	150	150	150	150
R-squared	0.896	0.889	0.181	0.896	0.891	0.197
Kleibergen-Paap Wald rk F statistics	47.27***			51.71***		
Kleibergen-Paap rk LM statistics	3.96**			4.07**		
Anderson-Rubin Wald test	43.56***			10.17***		

All models include country, benchmark year and industry fixed effects

Importantly, both instruments are positive and statistically significant in the first stage (as reported in Table A.4). Regarding the diagnostics, (1) the Kleibergen-Paap Wald rk F statistic shows that our models are not weakly identified; (2) the Kleibergen-Paap rk LM statistic shows that our models are not under-identified; and (3) the Anderson-Rubin Wald test shows that orthogonality conditions are valid. In sum, the results from our IV estimations (paired with the other analyses

using panel techniques) support our main findings, and indicate that the arrow of causality goes from preferential trade liberalization to affiliate sales to the United States, and not the other way around.

E.2 Firms without Prior Supply Chain Activities

To further mitigate concerns about reverse causality, we re-run our main models limiting the sample to U.S. affiliates that *did not* conduct trade-related activities *before* the formation of the U.S. PTA. Concretely, we drop observations that have positive vertical and export-platform sales in the pre-PTA period. The intuition is that these affiliates without global supply chains will anticipate smaller benefits from trade liberalization. These horizontal affiliates have weaker incentives to lobby for preferential and MFN cuts, which may introduce competition to their domestically oriented (i.e., local sales) operations. In other words, the subsample allows us to estimate the more conservative effects of trade liberalization among firms for which endogeneity is less likely to be a concern.

Table A.5 shows that our main results hold in the case of these conservative estimations: U.S. PTAs and PTA cuts lead to an expansion of vertical sales among the largest affiliates; WTO membership (and WTO cuts) do not scale with affiliate size.[59] When conducting the analysis on export-platform sales, we find that PTA and WTO cuts are both associated with higher exports by the largest MNCs (see Table A.6).

[59]Similar results are obtained using a subsample of affiliates from PTA partners with no pre-PTA sales to the United States (Columns 5–7), or when replacing employment with PPE, HQ, and affiliate productivity (not reported but available upon request).

Table A.5: Sub-sample: Firms with no pre-PTA vertical sales

	(1) Vertical Sales	(2) Vertical Sales	(3) Vertical Sales	(4) Vertical Sales	(5) Vertical Sales	(6) Vertical Sales	(7) Vertical Sales
Ln GDP/capita	0.092	0.087	0.044	0.018	-1.099*	-1.101*	-2.761*
	(0.263)	(0.258)	(0.352)	(0.366)	(0.633)	(0.610)	(1.488)
GATT only	0.206	0.187	0.113	0.102	-0.487**	-0.503**	-0.878*
	(0.213)	(0.215)	(0.170)	(0.177)	(0.178)	(0.186)	(0.421)
WTO member (partner)	0.222	0.298			-1.081**	-0.783	
	(0.261)	(0.273)			(0.429)	(0.544)	
BIT with US	-0.057	-0.047	-0.065	-0.063	-0.497**	-0.404*	-0.711*
	(0.126)	(0.119)	(0.144)	(0.144)	(0.222)	(0.229)	(0.395)
Ln Cumulative PTAs (partner)	0.053	0.052	0.013	0.012	0.358	0.289	-0.310
	(0.040)	(0.039)	(0.049)	(0.052)	(0.357)	(0.309)	(0.960)
PTA with US	1.338***	2.073***			-0.267**	1.752***	
	(0.210)	(0.323)			(0.123)	(0.124)	
Ln Employment (affiliate)	0.420***	0.466***	0.444***	0.467***	0.026	0.345***	0.061**
	(0.033)	(0.031)	(0.026)	(0.028)	(0.020)	(0.091)	(0.025)
PTA x Ln Employment	0.182***				0.503***		
	(0.048)				(0.018)		
WTO member (partner) x Ln Employment		-0.017				0.072	
		(0.023)				(0.042)	
WTO Cuts (US) x Ln Employment			0.713**	0.951			
			(0.342)	(0.864)			
PTA Tariff Cuts (US)			-0.280	3.310***			-0.904
			(0.218)	(1.116)			(0.748)
PTA Tariff Cuts (US) x Ln Employment			0.746***				1.107***
			(0.183)				(0.176)
WTO Cuts (US) x Ln Employment				-0.044			
				(0.121)			
Observations	80526	80526	71540	71540	17759	17759	8780
R-squared	0.120	0.118	0.129	0.125	0.220	0.202	0.442
Countries	165	165	163	163	21	21	19

All models exclude affiliates from PTA signatory countries with pre-PTA sales to the US; models (4)-(7) only includes affilates from PTA signatory countries.

Note: The dependent variable is the log of affiliate sales to the host country based on affiliate-level data from the BEA. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table A.6: Sub-sample: Firms with no pre-PTA export platform sales

	(1) Export Platform Sales	(2) Export Platform Sales	(3) Export Platform Sales	(4) Export Platform Sales	(5) Export Platform Sales
Ln GDP/capita	-0.222	0.117	0.119	-0.131	-0.128
	(0.396)	(0.387)	(0.389)	(0.454)	(0.456)
GATT only	1.179***	0.989***	0.991***	0.866***	0.870***
	(0.333)	(0.201)	(0.202)	(0.224)	(0.225)
BIT with US	0.321	0.576**	0.577**	0.395	0.396
	(0.306)	(0.272)	(0.272)	(0.275)	(0.275)
Ln Cumulative PTAs (partner)	0.193**	0.209***	0.208***	0.211**	0.210**
	(0.083)	(0.069)	(0.069)	(0.083)	(0.083)
WTO member (partner)	1.323***				
	(0.374)				
Ln Employment (affiliate)	0.603***	0.631***	0.630***	0.576***	0.574***
	(0.049)	(0.036)	(0.037)	(0.042)	(0.043)
WTO member (partner) x Ln Employment	-0.038				
	(0.025)				
WTO Cuts (partner)		1.368***	0.164	1.835***	0.154
		(0.304)	(0.356)	(0.430)	(0.340)
PTA Tariff Cuts (partner)		1.055***	1.054***		
		(0.268)	(0.268)		
WTO Cuts (partner) x Ln Employment			0.211***		0.294***
			(0.069)		(0.073)
Observations	82752	71364	71364	82737	82737
R-squared	0.156	0.151	0.151	0.156	0.156
Countries	165	164	164	165	165

Note: The dependent variable is the log of affiliate sales to the third countries based on affiliate-level data from the BEA. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

E.3 Entropy Balancing

It might be the case that firms in countries with a U.S. PTA differ significantly from firms in countries without a U.S. PTA. For instance, it is plausible that the United States picks trade partners that have productive firms to reap the largest benefits of preferential integration. In econometric terms, observations are unbalanced with respect to the treatment variable PTA. This poses a threat to inference if these observed differences are also correlated with differences in vertical sales, or if they proxy for unobserved differences that might drive the correlation. To help overcome this issue, we rely on entropy balancing Hainmueller (2012). This technique is similar to propensity

score matching, but it has the welcome feature that unbalanced observations are not dropped from the analysis.[60]

Specifically, by using entropy balancing, observations are re-weighted with respect to the treatment, in our case *PTA* and *Positive PTA Cuts*, so that all the relevant covariates are balanced (i.e., they have the same mean). In econometric terms, entropy balancing reweights the observations to statistically generate a region of common support in which firms in countries with a U.S. PTA and firms in countries without a U.S. PTA are comparable on structural covariates. Entropy balancing does this by directly incorporating covariate balance into the weight function that is applied to the sample units. The net result is that we can compare firms in countries with a U.S. PTA to a comparable counterfactual of firms in countries without a U.S. PTA.

Table A.7 shows the means of firm-level covariates before and after running 'ebalance' for both *PTA* and *Positive PTA cuts*. By using entropy balancing, the difference in means between treatment and control firms is substantially reduced and is never statistically significantly different from zero. Then we re-run our main models using the weights obtained from entropy balancing. Our main results reproduced in Table A.8 remain unchanged, which increases the plausibility of our initial econometric strategy. Our results confirm that preferential liberalization increases the vertical sales of the largest and most productive firms.

[60]We use the command 'ebalance' in Stata 12. We adjust the covariates using the first moment, i.e., we set target equal to one.

Table A.7: Balance of covariates before and after weighting

Models (1)-(2)

Original sample

	PTA Countries			Control		
Variable	mean	variance	skewness	mean	variance	skewness
Ln Employment	4.467	5.189	-0.464	4.152	4.447	-0.454
Exporter	0.503	0.250	-0.012	0.506	0.250	-0.025
Ln Assets (PPE)	8.010	11.610	-0.908	7.655	11.060	-0.874
Local Share	0.786	0.121	-1.412	0.774	0.127	-1.320

After entropy weighting

	PTA Countries			Control		
Variable	mean	variance	skewness	mean	variance	
Ln Employment	4.467	5.189	-0.464	4.466	4.116	-0.5017
Exporter	0.503	0.250	-0.012	0.503	0.250	-0.01242
Ln Assets (PPE)	8.010	11.610	-0.908	8.010	9.922	-0.9426
Local Share	0.786	0.121	-1.412	0.786	0.119	-1.406

Models (3)-(4)

Original sample

	PTA Countries			Control		
Variable	mean	variance	skewness	mean	variance	skewness
Ln Employment	4.943	2.929	-0.635	4.168	4.600	-0.431
Exporter	0.758	0.184	-1.202	0.497	0.250	0.014
Ln Assets (PPE)	9.164	6.546	-0.961	7.649	11.240	-0.864
Local Share	0.692	0.125	-0.848	0.779	0.126	-1.354

After entropy weighting

	PTA Countries			Control		
Variable	mean	variance	skewness	mean	variance	skewness
Ln Employment	4.943	2.929	-0.635	4.939	3.823	-0.614
Exporter	0.758	0.184	-1.202	0.756	0.184	-1.194
Ln Assets (PPE)	9.164	6.546	-0.961	9.156	7.159	-0.881
Local Share	0.692	0.125	-0.848	0.692	0.138	-0.872

Table A.8: International Agreements and U.S. MNC Activities (Matched sample)

	(1)	(2)	(3)	(4)
	Vertical Sales	Vertical Sales	Vertical Sales	Vertical Sales
Ln GDP/capita	0.025	0.031	-0.081	-0.020
	(0.196)	(0.197)	(0.482)	(0.445)
GATT only	0.162	0.181	-0.216	-0.163
	(0.149)	(0.149)	(0.346)	(0.324)
WTO Tariff Cuts	1.694***	1.763***	1.439***	1.589***
	(0.168)	(0.173)	(0.335)	(0.317)
BIT with US	-0.073	-0.077	-0.328	-0.337
	(0.157)	(0.164)	(0.255)	(0.269)
Ln Cumulative PTAs (partner)	0.073	0.077	0.041	0.047
	(0.054)	(0.055)	(0.112)	(0.109)
PTA with US	0.092	-0.340*		
	(0.104)	(0.178)		
Ln Employment (affiliate)	0.584***	0.528***	0.858***	0.712***
	(0.039)	(0.034)	(0.130)	(0.048)
PTA with US x Ln Employment		0.096***		
		(0.036)		
PTA Tariff Cuts (US)			0.635	-1.110**
			(0.646)	(0.435)
PTA Tariff Cuts (US) x Ln Employment				0.356**
				(0.166)
Observations	78733	78733	69996	69996
R-squared	0.147	0.147	0.276	0.280
Countries	165	165	163	163
All models include benchmark year and industry fixed effects				

Note: The dependent variable is the log of affiliate sales to the U.S.. Robust standard errors adjusted for country-level clustering. All models include country, year, and industry fixed effects. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

E.4 Tariff Cuts in Intermediate Goods

We expect sharper increases in vertical sales following higher tariff cuts in intermediate products, which constitute the bulk of global supply chain trade. We explore relationships between intermediates trade and liberalization in Table A.9 using BEA data on affiliate trade in intermediates.[61] In Column 1, we model intermediate goods imported by the foreign affiliate from the U.S. parent. The results reproduced in Column 1 suggest that tariff cuts implemented by the partner country under a U.S. PTA have a strong effect on intermediate sales to the affiliate; the result is significant at 95%,

[61]Following Hanson et al. (2005), we capture trade in intermediates using the BEA measure of affiliate imports from the United States of "goods intended for further processing, assembly, or manufacture."

and substantively large: a 10% increase in preferential tariff cuts would result in a 3.25% increase in HQ sales of intermediate goods. Tariff cuts offered by the host country on MFN terms under WTO, meanwhile, result in a 1.4% drop in HQ sales of intermediate goods to the affiliate. The difference between preferential and MFN tariff cuts becomes apparent: under preferential liberalization, the parent company faces a preferential cut advantage, which leads to higher intermediate sales; when the host country lowers tariffs on MFN terms, the affiliate may procure from the home country or from third parties.

Next we explore whether tariff cuts offered by the host under the WTO have stronger effects on export-platform activities among firms in industries with high intermediate input intensities—a result that would follow from our argument. Column 2 in Table A.9 interacts tariff cuts with the intensity of industry intermediate goods.[62] We find that the positive relationship between tariff cuts and export-platform sales increases with the intensity of intermediate goods imports. The results are shown graphically in Figure A.1. In Column 3, we find that the result holds when country-year fixed effects are included.

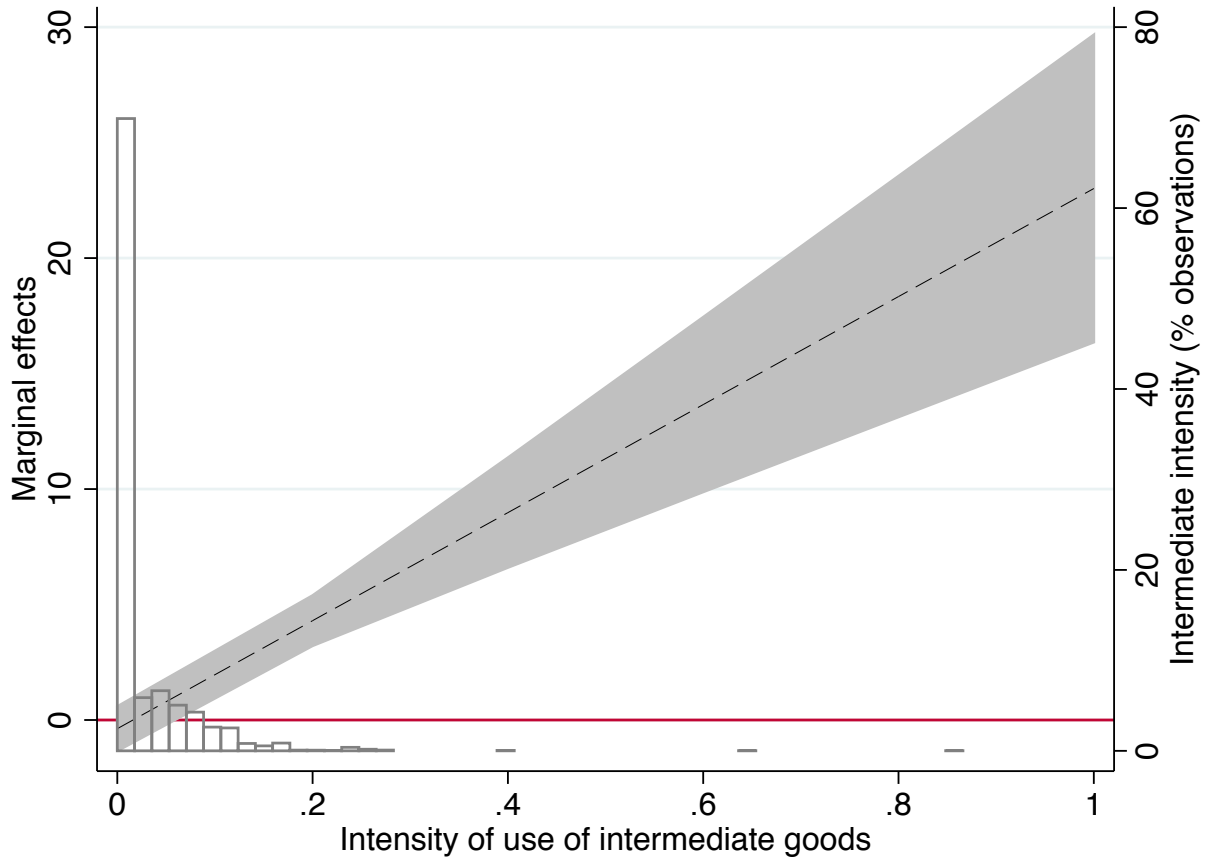
[62]To construct intermediate goods intensities at the industry level, we compute the share of intermediates in total sales for each industry-benchmark year, 1994–2009.

Table A.9: Tariff Cuts and Export-Platform Sales by Intensity of Use of Intermediates

Dependent Variable	(1) Imported Intermediates from HQ	(2) Export Sales	(3) Export Sales
Ln GDP/capita	0.003	-0.063	
	(0.152)	(0.448)	
GATT only	0.345*	0.527**	
	(0.196)	(0.229)	
WTO member (partner)	-0.151**	0.272	
	(0.063)	(0.307)	
BIT with US	0.240	0.496	
	(0.160)	(0.424)	
Ln Cumulative PTAs (partner)	-0.022	0.227**	
	(0.026)	(0.092)	
PTA Tariff Cuts (partner)	0.335**		
	(0.154)		
WTO Cuts (partner)		-0.505	-0.506
		(0.436)	(0.389)
Intermediate intensity		-0.205	-0.100
		(0.745)	(0.738)
WTO Cuts (partner) x Intermediate intensity		22.662***	21.796***
		(3.643)	(3.353)
Constant	2.369**	1.620	5.364***
	(1.186)	(3.262)	(0.223)
Observations	51824	69988	69988
R-squared	0.0624	0.0906	0.207
Countries	158	164	164
Fixed effects	Country, Year	Country, Year, Industry	Country-year, Industry

Note: The dependent variable in Column 1 is the log of the sales of goods for further processing from the U.S. parent company to the affiliate. The dependent variable in Column 2 is the log of sales by U.S. affiliates to third countries. Intermediate intensity is defined in the text. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Figure A.1: Marginal Effect of Host Country MFN Tariff Cuts on Export-Platform Sales by Intensity of Use of Intermediate Goods



Note: Marginal effects (and 90% confidence intervals) of host country MFN cuts on affiliate sales to third markets based on Results from Column 2 in Table A.9.

E.5 Other Model Specifications

Our results hold if we include country-, industry-, and country-industry-specific time trends, which capture slow-moving unobserved confounders affecting affiliate sales that vary by host country or industry (Tables A.10 and A.11). Adding such trends allows us to test whether the parallel assumption holds in our estimates, which is indeed the case. Moreover, we also introduce parent firm-level fixed effects as well parent-year fixed effects to control for unobserved heterogeneity at the parent firm level (Tables A.10 and A.11). Furthermore, our results hold if we use different operationalizations of size such as PPE and total factor productivity calculated at the parent level (Tables A.12 and A.13). We augment the model specification with a battery of political and economic control variables in γC_{it}, as recommended by Büthe and Milner (2014). The economic variables include: economic performance (GDP growth), the host country's market size (the log of the host country population), and trade openness (imports and exports as a percentage of GDP). As political controls, we include political constraints (Henisz, 2000) and political stability (Banks, 1999). The

coefficients on the independent variables of interest remain the same in substantive and statistical terms (Tables A.10 and A.11). The control variables are (five-year) lagged average values, inclusive of the benchmark year *j*. Importantly, our findings are not sensitive to the operationalization of our key variables or different transformations of the dependent variable. Our findings hold if we use tariff cuts instead of percentage change in tariff cuts. In additional specifications, we modeled the *share* of sales directed to the United States in total affiliate sales. Consistent with the results reported here, we find that high-productivity firms direct a greater share of sales to the United States during years in which the host country participates in a PTA with the United States (results available from the authors upon request).

Table A.10: Robustness Tests: Vertical Sales

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	Vertical Sales	Vertical Sales	Vertical Sales	Vertical Sales	Vertical Sales	Vertical Sales	Vertical Sales	Vertical Sales	Vertical Sales	Vertical Sales	Vertical Sales	Vertical Sales	Vertical Sales
Ln GDP/capita	0.250	0.124	-0.104	-0.296	0.277*	0.119	-0.230	-0.234	-0.090	-0.279	-0.180	-0.358	
	(0.181)	(0.262)	(0.274)	(0.308)	(0.162)	(0.254)	(0.289)	(0.303)	(0.287)	(0.308)	(0.257)	(0.289)	
GDP growth	0.001	0.001	-0.010	-0.009	0.008	0.009	-0.009	-0.003	-0.009	-0.007	-0.011	-0.007	
	(0.011)	(0.011)	(0.010)	(0.010)	(0.010)	(0.010)	(0.009)	(0.009)	(0.011)	(0.010)	(0.010)	(0.010)	
Ln Population	0.252	-0.077	-1.635	0.215	0.304	0.130	-1.878	-1.513	-1.545	0.374	-1.926	0.382	
	(0.390)	(0.392)	(1.434)	(1.957)	(0.385)	(0.362)	(1.348)	(1.642)	(1.433)	(1.781)	(1.268)	(1.682)	
Political Constraints	-0.049	0.016	0.339*	0.489**	0.028	0.175	0.312*	0.345**	0.335*	0.442*	0.478***	0.592**	
	(0.212)	(0.196)	(0.189)	(0.233)	(0.200)	(0.196)	(0.158)	(0.166)	(0.192)	(0.244)	(0.172)	(0.242)	
Political Instability	-0.0001	0.027	0.021	0.029	0.007	0.035	0.030*	0.033*	0.017	0.027	0.017	0.028	
	(0.015)	(0.025)	(0.018)	(0.021)	(0.013)	(0.022)	(0.016)	(0.018)	(0.016)	(0.019)	(0.013)	(0.018)	
Trade/GDP	0.002	0.004	0.002	0.002	0.002	0.003	0.003	0.001	0.001	0.001	0.002	0.000	
	(0.002)	(0.003)	(0.003)	(0.004)	(0.002)	(0.002)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)	(0.003)	
GATT only	0.299**	0.211*	0.326	0.110*	0.340*	0.153**	0.259	0.112*	0.292	0.110	0.317*	0.056	
	(0.149)	(0.116)	(0.214)	(0.064)	(0.182)	(0.074)	(0.203)	(0.058)	(0.196)	(0.071)	(0.175)	(0.060)	
WTO member (partner)	0.229		0.210		0.233		0.162		0.217		0.276		
	(0.210)		(0.222)		(0.198)		(0.211)		(0.201)		(0.178)		
WTO Cuts (US)		0.490*		0.325		0.731***		0.594**		0.523**		0.205	
		(0.282)		(0.228)		(0.271)		(0.266)		(0.241)		(0.251)	
BIT with US	0.171	0.054	0.097	0.003	0.187	0.159	-0.005	-0.044	0.094	0.013	0.056	-0.056	
	(0.111)	(0.146)	(0.319)	(0.336)	(0.121)	(0.155)	(0.299)	(0.297)	(0.307)	(0.332)	(0.268)	(0.297)	
Ln Cumulative PTAs (partner)	0.019	-0.016	-0.028	-0.037	-0.028	-0.061	-0.036	-0.035	-0.021	-0.031	-0.004	-0.002	
	(0.033)	(0.048)	(0.079)	(0.090)	(0.035)	(0.040)	(0.085)	(0.090)	(0.081)	(0.093)	(0.078)	(0.095)	
PTA with US	-0.480***		-0.806***		-0.497***		-0.136		-0.775***		-0.765***		
	(0.135)		(0.117)		(0.125)		(0.114)		(0.116)		(0.178)		
PTA x Ln Employment	0.144***		0.150***		0.147***		0.012		0.153***		0.142**		0.149***
	(0.045)		(0.044)		(0.048)		(0.027)		(0.047)		(0.063)		(0.041)
Ln Employment (affiliate)	0.453***	0.477***	0.451***	0.475***	0.452***	0.475***	0.472***	0.473***	0.451***	0.476***	0.479***	0.502***	0.457***
	(0.022)	(0.022)	(0.022)	(0.022)	(0.021)	(0.021)	(0.022)	(0.023)	(0.022)	(0.022)	(0.023)	(0.022)	(0.023)
PTA Tariff Cuts (US)		-2.063***		-2.853***		-2.107***		-3.188***		-2.875***		-2.560***	
		(0.389)		(0.510)		(0.405)		(0.742)		(0.597)		(0.477)	
Tariff Cuts (US) x		0.683***		0.656***		0.695***		0.665***		0.667***		0.589***	
x Ln Employment		(0.187)		(0.199)		(0.199)		(0.190)		(0.211)		(0.195)	
Fixed effects	Industry, Country, Year	Industry, Country, Year	Industry, Country	Industry, Country	Industry, Country	Industry, Country	Industry, Country	Industry, Country	Industry, Country	Industry, Country	HQ, Country	HQ, Country	Country/ Year
Trends			Country	Country	Industry	Industry	Industry/ Country	Industry/ Country	Industry, Country	Industry, Country	Industry, Country	Industry, Country	Industry
Observations	77620	69014	77620	69014	77620	69014	77620	69014	77620	69014	77620	69014	82946
R-squared	0.108	0.120	0.110	0.123	0.117	0.128	0.138	0.139	0.120	0.132	0.214	0.222	0.212
Countries	152	150	152	150	152	150	152	150	152	150	152	150	165

Note: The dependent variable is the log of affiliate sales to the U.S.. Robust standard errors adjusted for country-level clustering. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table A.11: Robustness Tests: Export Platform Sales

	(1) Export Platform Sales	(2) Export Platform Sales	(3) Export Platform Sales	(4) Export Platform Sales	(5) Export Platform Sales	(6) Export Platform Sales	(7) Export Platform Sales	(8) Export Platform Sales	(9) Export Platform Sales	(10) Export Platform Sales	(11) Export Platform Sales	(12) Export Platform Sales	(13) Export Platform Sales
Ln GDP/capita	-0.066	-0.256	-0.734	-0.395	0.026	-0.387	-0.453	-0.095	-0.687	-0.498	-0.554	-0.403	
	(0.226)	(0.257)	(0.906)	(0.819)	(0.348)	(0.338)	(0.903)	(0.772)	(0.716)	(0.649)	(0.928)	(0.833)	
GDP growth	-0.012	-0.007	-0.011	-0.010	0.010	0.002	-0.015	-0.019	-0.016	-0.015	-0.010	-0.009	
	(0.016)	(0.017)	(0.037)	(0.033)	(0.017)	(0.019)	(0.034)	(0.032)	(0.028)	(0.027)	(0.038)	(0.033)	
Ln Population	1.951***	2.375***	-5.103	-4.803	0.607	0.860	-4.837	-4.262	-4.416	-3.599	-6.131	-4.863	
	(0.570)	(0.644)	(4.642)	(3.486)	(0.704)	(0.707)	(4.320)	(3.065)	(3.971)	(2.906)	(4.287)	(3.077)	
Political Constraints	0.091	0.056	0.453	0.346	-0.020	-0.098	0.473	0.316	0.537	0.439	0.712	0.686	
	(0.417)	(0.428)	(0.554)	(0.558)	(0.437)	(0.431)	(0.512)	(0.525)	(0.484)	(0.488)	(0.504)	(0.483)	
Political Instability	0.016	0.034	0.172	0.137	0.068	0.048	0.166	0.123	0.146	0.124	0.156	0.129	
	(0.026)	(0.030)	(0.111)	(0.093)	(0.059)	(0.054)	(0.102)	(0.084)	(0.093)	(0.080)	(0.097)	(0.084)	
Trade/GDP	0.0001	0.004	0.011	0.017**	0.005	0.008*	0.010	0.016**	0.007	0.013*	0.007	0.014*	
	(0.004)	(0.005)	(0.008)	(0.008)	(0.004)	(0.005)	(0.008)	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)	
GATT only	0.329*	0.128	1.425*	1.880***	1.036**	1.586***	1.445*	1.804***	1.356*	1.730***	1.596**	1.845***	
	(0.192)	(0.178)	(0.822)	(0.181)	(0.462)	(0.170)	(0.795)	(0.175)	(0.740)	(0.177)	(0.739)	(0.150)	
WTO member (partner)	0.224		-0.628		-0.811		-0.519		-0.553		-0.398		
	(0.246)		(0.853)		(0.544)		(0.826)		(0.781)		(0.781)		
BIT with US	0.405	0.185	-0.226	-0.179	-0.020	-0.291	-0.249	-0.185	-0.175	-0.170	-0.153	-0.092	
	(0.265)	(0.275)	(0.270)	(0.262)	(0.312)	(0.381)	(0.268)	(0.265)	(0.245)	(0.242)	(0.281)	(0.270)	
Ln Cumulative PTAs (partner)	0.198***	0.187**	-0.230**	-0.199**	-0.012	-0.012	-0.184**	-0.129	-0.185**	-0.163*	-0.152*	-0.139*	
	(0.072)	(0.073)	(0.104)	(0.098)	(0.073)	(0.074)	(0.087)	(0.098)	(0.093)	(0.085)	(0.085)	(0.077)	
PTA Cuts (Partner)	-0.659*		-1.389**		-1.022***		-1.078**		-1.557***		-0.851		-1.833*
	(0.357)		(0.580)		(0.322)		(0.523)		(0.523)		(0.682)		(1.055)
Ln Employment (affiliate)	0.637***	0.577***	0.629***	0.569***	0.633***	0.574***	0.627***	0.571***	0.630***	0.572***	0.686***	0.631***	0.631***
	(0.037)	(0.044)	(0.037)	(0.044)	(0.037)	(0.044)	(0.038)	(0.044)	(0.037)	(0.044)	(0.036)	(0.042)	(0.037)
PTA Cuts (partner) x	0.315***		0.289***		0.316***		0.268***		0.280***		0.168		0.275***
x Ln Employment	(0.107)		(0.095)		(0.108)		(0.091)		(0.098)		(0.124)		(0.092)
WTO Cuts (Partner)		-1.075***		-0.707*		-1.016**		2.097***		-0.813**		-1.141**	
		(0.346)		(0.378)		(0.436)		(0.604)		(0.325)		(0.438)	
WTO Cuts (partner) x		0.321***		0.324***		0.303***		0.271***		0.303***		0.376***	
x Ln Employment		(0.080)		(0.081)		(0.078)		(0.085)		(0.077)		(0.092)	
Fixed effects	Industry, Country, Year	Industry, Country, Year	Industry, Country	Industry, Country	Industry, Country	Industry, Country	Industry, Country	Industry, Country	Industry, Country	Industry, Country	HQ, Country	HQ, Country	Country/ Year
Trend			Country	Country	Industry	Industry	Industry/ Country	Industry/ Country	Industry, Country	Industry, Country	Country, Industry	Country, Industry	Industry
Observations	67152	77605	67152	77605	67152	77605	67152	77605	67152	77605	67152	77605	71573
R-squared	0.149	0.152	0.143	0.148	0.153	0.156	0.161	0.170	0.157	0.161	0.269	0.260	0.267
Countries	151	152	151	152	151	152	151	152	151	152	151	152	164

Note: The dependent variable is the log of affiliate sales to third countries. Robust standard errors adjusted for country-level clustering. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table A.12: U.S. PTA and Vertical Sales by Affiliate Size and Productivity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Vertical Sales	Vertical Sales	Vertical Sales	Vertical Sales	Vertical Sales	Vertical Sales	Vertical Sales	Vertical Sales
Ln GDP/capita	0.307	0.201	0.211	0.344*	0.245	0.193	0.333*	0.248
	(0.223)	(0.184)	(0.183)	(0.194)	(0.220)	(0.190)	(0.201)	(0.220)
GATT only	0.376*	0.270	0.283*	0.261	0.397**	0.256	0.239	0.400**
	(0.198)	(0.169)	(0.168)	(0.172)	(0.181)	(0.177)	(0.185)	(0.181)
WTO member (partner)	0.268	0.204	0.202	0.194	0.296	0.524*	0.931***	0.328
	(0.258)	(0.245)	(0.243)	(0.263)	(0.232)	(0.289)	(0.350)	(0.239)
BIT with US	0.271**	0.231**	0.227**	0.212**	0.300**	0.235**	0.222**	0.300**
	(0.135)	(0.105)	(0.106)	(0.108)	(0.124)	(0.102)	(0.097)	(0.121)
Ln Cumulative PTAs (partner)	0.048	0.021	0.021	0.002	0.065**	0.023	-0.003	0.068**
	(0.031)	(0.026)	(0.027)	(0.028)	(0.032)	(0.026)	(0.028)	(0.032)
PTA with US	0.154	0.120	-0.466***	-0.981***	0.149	0.131	0.104	0.173
	(0.107)	(0.097)	(0.120)	(0.224)	(0.120)	(0.099)	(0.124)	(0.113)
Ln Employment (affiliate)		0.484***	0.458***			0.534***		
		(0.021)	(0.023)			(0.033)		
PTA x Ln Employment			0.141***					
			(0.043)					
WTO x Ln Employment						-0.070***		
						(0.024)		
Ln Assets (PPE, affiliate)				0.232***			0.325***	
				(0.014)			(0.027)	
PTA x Ln Assets (PPE)				0.142***				
				(0.041)				
WTO x Ln Assets (PPE)							-0.091***	
							(0.019)	
Productivity (headquarter)					0.003			0.140*
					(0.038)			(0.084)
PTA x Productivity					0.166**			
					(0.064)			
WTO x Productivity								-0.141*
								(0.075)
Fixed effects	Industry, country, year	Industry, country, year	Industry, country, year	Industry, country, year	Industry, country, year	Industry, country, year	Industry, country, year	Industry, country, year
Observations	82946	82946	82946	82946	74394	82946	82946	74394
R-squared	0.0471	0.106	0.107	0.0917	0.0482	0.106	0.0903	0.0482
Countries	165	165	165	165	163	165	165	163

Note: The dependent variable is the log of affiliate sales to the U.S.. Robust standard errors adjusted for country-level clustering. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

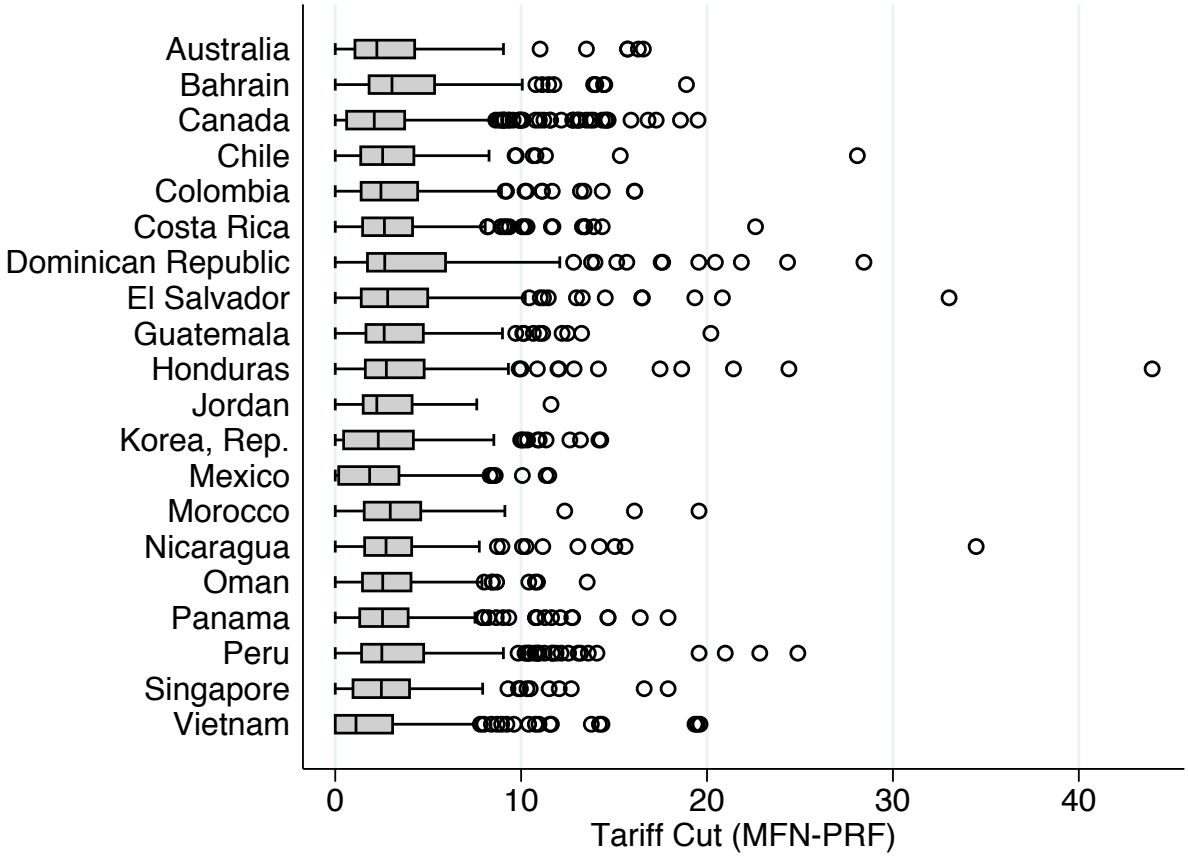
Table A.13: U.S. PTA and Export Platform Sales by Affiliate Size and Productivity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Export Platform Sales	Export Platform Sales	Export Platform Sales	Export Platform Sales	Export Platform Sales	Export Platform Sales	Export Platform Sales	Export Platform Sales
Ln GDP/capita	-0.481	-0.608**	-0.630**	-0.439	-0.623*	-0.560*	-0.394	-0.570
	(0.337)	(0.297)	(0.299)	(0.279)	(0.336)	(0.320)	(0.296)	(0.360)
GATT only	0.762***	0.636***	0.610***	0.582***	0.763***	0.601***	0.569***	0.748***
	(0.196)	(0.173)	(0.180)	(0.172)	(0.193)	(0.164)	(0.165)	(0.184)
WTO member (partner)	0.622**	0.546**	0.550**	0.518*	0.720***	0.747**	1.102***	0.764***
	(0.267)	(0.257)	(0.263)	(0.287)	(0.234)	(0.309)	(0.356)	(0.251)
BIT with US	0.383	0.336	0.344	0.306	0.380	0.339	0.317	0.384
	(0.246)	(0.275)	(0.272)	(0.270)	(0.274)	(0.258)	(0.259)	(0.256)
Ln Cumulative PTAs (partner)	0.253***	0.221***	0.221***	0.181**	0.276***	0.192**	0.160**	0.243***
	(0.081)	(0.080)	(0.078)	(0.075)	(0.078)	(0.083)	(0.077)	(0.082)
PTA with US	0.544***	0.503***	1.733***	1.648***	0.588***			
	(0.112)	(0.102)	(0.308)	(0.364)	(0.120)			
Ln Employment (affiliate)		0.578***	0.631***			0.613***		
		(0.042)	(0.035)			(0.047)		
PTA x Ln Employment			-0.297***					
			(0.053)					
WTO x Ln Employment						-0.048**		
						(0.022)		
Ln Assets (PPE, affiliate)				0.347***			0.379***	
				(0.021)			(0.029)	
PTA x Ln Assets (PPE)				-0.156***				
				(0.038)				
WTO x Ln Assets (PPE)							-0.073***	
							(0.020)	
Productivity (headquarter)					0.179***			0.343***
					(0.035)			(0.053)
PTA x Productivity					-0.046			
					(0.052)			
WTO x Productivity								-0.218***
								(0.050)
Fixed effects	Industry, country, year	Industry, country, year	Industry, country, year	Industry, country, year	Industry, country, year	Industry, country, year	Industry, country, year	Industry, country, year
Observations	82946	82946	82946	82946	74394	82946	82946	74394
R-squared	0.0966	0.154	0.157	0.144	0.100	0.153	0.142	0.0997
Countries	165	165	165	165	163	165	165	163

Note: The dependent variable is the log of total affiliate sales to third countries. Robust standard errors adjusted for country-level clustering. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

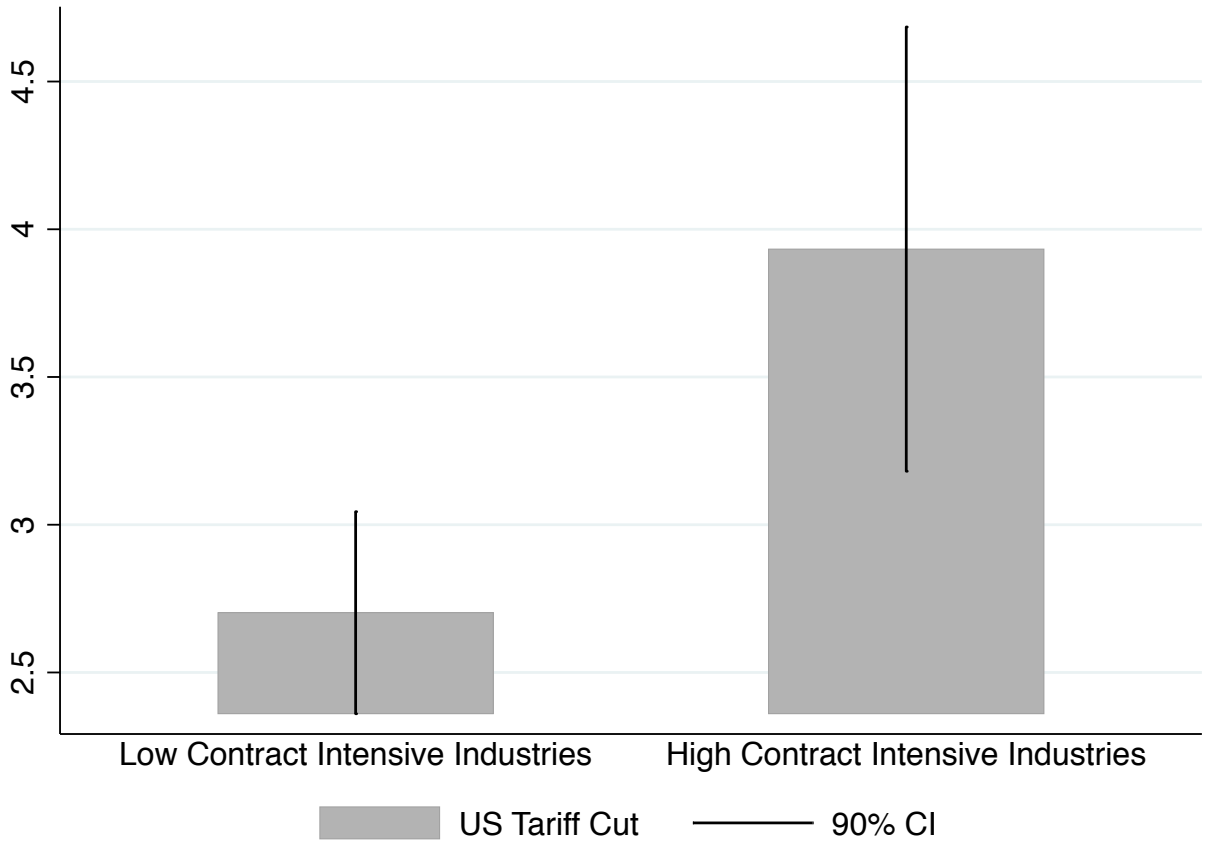
Appendix F Additional Figures and Tables

Figure A.2: Tariff reductions in U.S. PTAs since 1990



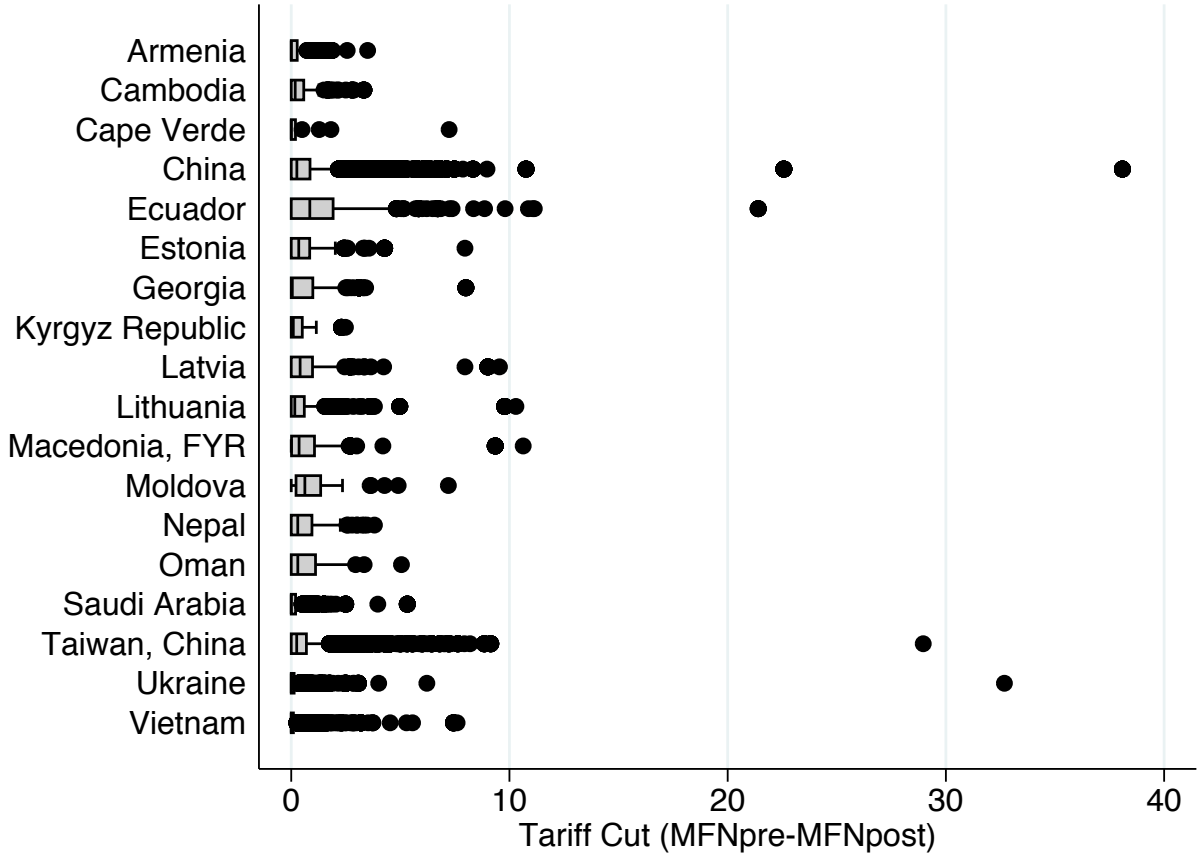
Note: The figure displays the distribution of tariff cuts (MFN-PRF) for 20 PTAs signed by the U.S. after 1990. Data come from WITS (2014) and are at the HS 6-digit tariff line.

Figure A.3: Mean tariff reductions in U.S. PTAs by contract intensity of product



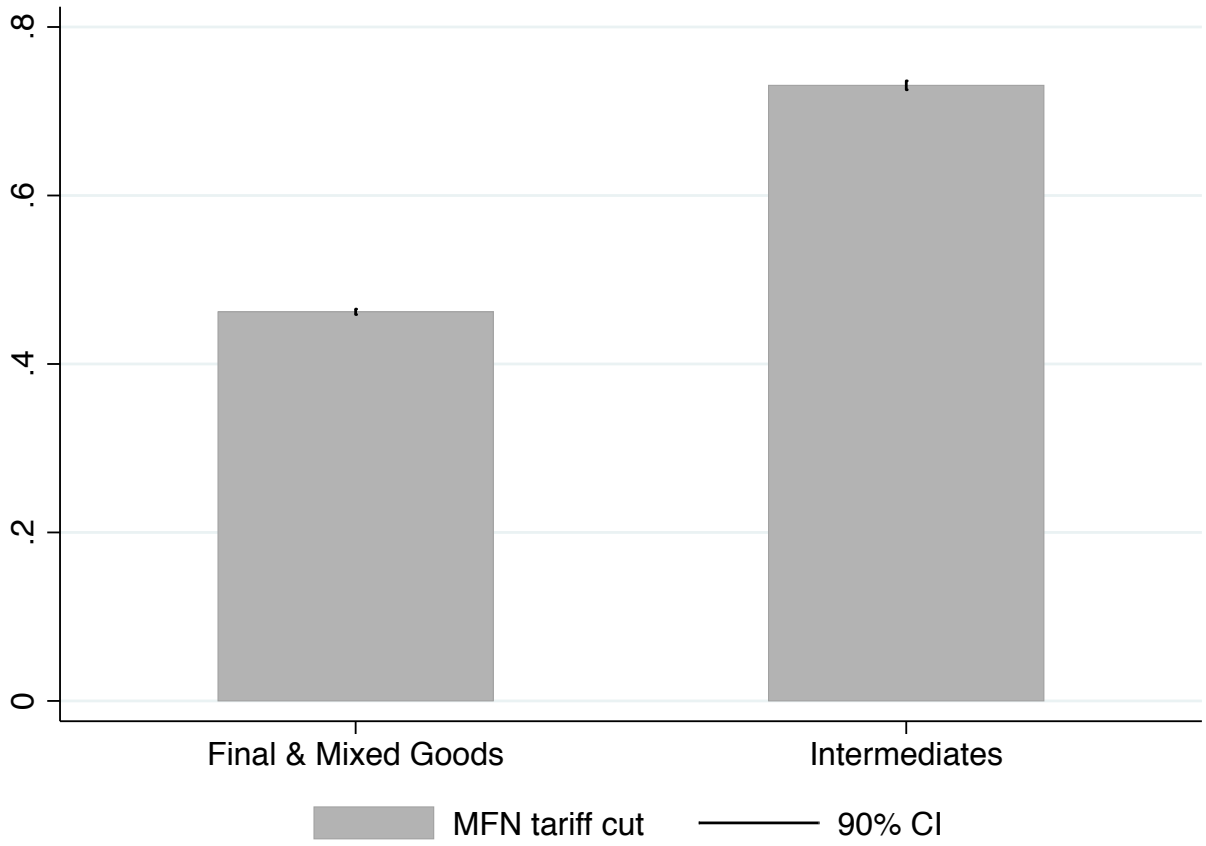
Note: The figure displays the differences between MNF tariffs prior to the formation of PTAs and preferential tariffs (PRF) after PTA is in force, by type contract intensity. The measure of contract intensive product comes Nunn (2007). The whiskers represent 90% confidence intervals.

Figure A.4: MFN Tariff Reductions in pre- and post-WTO Accesion



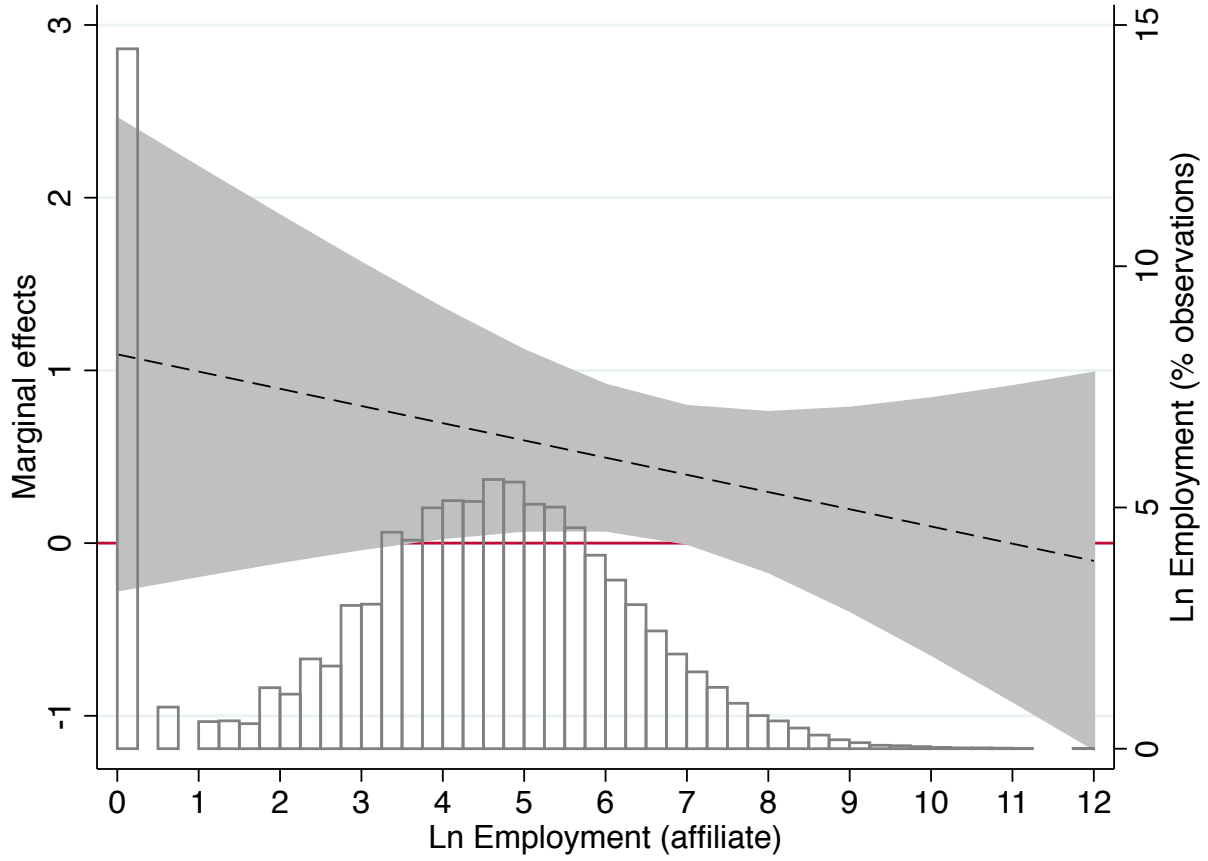
Note: The figure displays the distribution of MFN tariff cuts after accession to WTO. Data come from WITS (2014) and are at the HS 6-digit tariff line.

Figure A.5: Mean of MFN tariff reductions by product use



Note: The figure displays the differences between MNF tariffs prior and after WTO accession by type of product classified as intermediate or consumption and mixed use. The categorization of products come from Bekkers et al. (2012) and Francois and Pindyuk (2012). The whiskers represent 90% confidence intervals.

Figure A.6: Marginal Effect of U.S. MFN Tariff Cuts on Vertical Sales by Firm Size



Note: Marginal effects (and 90% confidence intervals) of U.S. MFN Cuts based on Results from Column 7 in Table 2.

Table A.14: Change in Herfindahl-Hirschman Indices of Employment and Sales Concentration After PTA with the U.S.

	HHI Sales		HHI Employment	
	Change	Percentage	Change	Percentage
Australia	-0.009	-2.6%	0.103	28.7%
Bahrain	0.116	13.9%	0.020	2.3%
Canada	0.075	39.2%	0.063	27.8%
Chile	-0.022	-3.7%	-0.009	-1.4%
Colombia	0.077	13.3%	0.052	9.1%
Costa Rica	0.041	6.2%	0.038	5.7%
Dominican Republic	0.054	7.6%	0.065	9.3%
El Salvador	-0.037	-4.6%	-0.021	-2.8%
Guatemala	-0.049	-7.0%	-0.019	-2.7%
Honduras	0.145	21.2%	0.165	24.6%
Jordan	-0.109	-10.9%	0.079	9.8%
Mexico	0.005	1.5%	0.073	23.5%
Morocco	0.142	17.6%	0.095	11.8%
Nicaragua	0.016	1.6%	0.083	9.1%
Oman	0.225	29.0%	0.282	39.3%
Panama	0.027	4.3%	0.136	24.1%
Peru	-0.042	-6.3%	0.017	2.7%
Singapore	0.023	6.0%	0.089	24.7%
South Korea	-0.035	-6.8%	0.013	2.5%
Vietnam	0.028	3.5%	-0.062	-7.7%
Average change	0.034	6.2%	0.063	12.0%

Table A.15: Design of U.S. PTAs

PTA	Year	Services	Investment	IPRs	Competition	Government Procurement	Depth
US-Australia	2004	Yes	Yes	Yes	Yes	Yes	3.19
US-Bahrain	2004	Yes	Yes	Yes	No	Yes	3.01
US-CAFTA-DR	2004	Yes	Yes	Yes	No	Yes	3.13
US-Canada	1988	Yes	Yes	No	No	Yes	1.90
US-Canada	1992	Yes	Yes	Yes	Yes	Yes	2.74
US-Chile	2003	Yes	Yes	Yes	No	Yes	2.90
US-Colombia	2006	Yes	Yes	Yes	Yes	Yes	3.40
US-Jordan	2000	Yes	Yes	Yes	No	Yes	2.59
US-Korea	2007	Yes	Yes	Yes	Yes	Yes	3.26
US-Mexico	1992	Yes	Yes	Yes	Yes	Yes	2.74
US-Morocco	2004	Yes	Yes	Yes	No	Yes	3.19
US-Oman	2006	Yes	Yes	Yes	No	Yes	3.19
US-Panama	2007	Yes	Yes	Yes	No	Yes	3.19
US-Peru	2006	Yes	Yes	Yes	Yes	Yes	3.33
US-Singapore	2003	Yes	Yes	Yes	Yes	Yes	3.01
US-Vietnam	2000	Yes	Yes	Yes	No	No	2.69

Note: "Yes" means that a specific section regulating each trade-related issue is included in the treaty. Depth is built using a latent trait analysis on 48 dummy variables related to trade-related issues (Dür et al., 2014).

Table A.16: Summary Statistics

Firm level variables

Variable	Observations	Average	Std. Dev.	Min	Max
Ln Total Sales	82,946	9.534	3.116	..	..
Ln Horizontal Sales	82,946	8.532	3.819	..	..
Ln Export Platform Sales	82,946	3.440	4.569	..	..
Ln Vertical Sales (to US)	82,946	2.154	3.731	..	..
Ln Employment (affiliate)	82,946	4.038	2.245	..	..
Ln PPE Assets (affiliate)	82,946	7.428	3.579	..	..
Productivity (headquarter)	74,394	0.178	0.610	..	..

.. Omitted to preserve anonimity of reporters

Country level variables

Variable	Observations	Average	Std. Dev.	Min	Max
Ln GDP/capita (partner)	708	8.177	1.593	4.451	11.851
GATT Only (partner)	708	0.250	0.433	0	1
WTO (partner)	708	0.500	0.500	0	1
BIT with US	708	0.189	0.392	0	1
Ln Cumulative PTA (partner)	708	3.168	1.063	0	5.352
PTA with US	708	0.049	0.217	0	1
Tariff Cut (US)	697	0.115	0.656	0	5.784
Tariff Cut Proportional (US)	697	0.030	0.162	0	1
Tariff Cut PTA (partner)	680	0.009	0.087	0	1
Tariff Cut WTO (partner)	708	0.001	0.016	0	0
Tariff Cut WTO Proportional (US)	707	0.002	0.020	0	0
HH Index (Employment)	20,506	0.671	0.344	0	1
HH Index (Sales)	20,506	0.696	0.320	0	1

Note: The maximum and minimum values of the firm-level variables are suppressed to avoid disclosure of confidential information.

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