Preferential Trade Agreements and Non-tariff Measures*

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Abstract

We study the product-level effects of Preferential Trade Agreements (PTAs) on the implementation of non-tariff measures (NTMs) using a global database spanning the 2000-2017 period. Employing an instrumental variable strategy, we provide evidence that an increase in the import share of PTA partners leads to a reduction in the application of NTMs. Exploring several mechanisms, we find that these effects are driven by products with higher preferential margins, the gap between MFN and preferential tariff rates. This result is consistent with what we call a "rent preservation effect," whereby PTA partner countries push to limit the imposition of NTMs in order to preserve their preferential rents. We find that the negative PTA-NTM nexus is stronger for deeper PTAs, technical NTMs, and advanced economies. But there is no evidence that the effects are confined to NTMs that target broader or narrower sets of countries, agricultural products, or products that are subject to more NTMs. Importantly, higher PTA import shares contribute to multilateral liberalization by lowering both the usage of NTMs against PTA members and non-PTA partners.

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1 Introduction

The rise in global trade tensions beginning with the first and continuing during the second Trump administration has highlighted the importance of understanding the determinants of trade policy. With increasingly limited cooperation and stalled reforms at the WTO, preferential trade agreements (PTAs) have become the focal point of trade policy negotiation efforts. PTAs have not only lowered tariffs between member countries but the existing evidence also suggests that PTAs induce reductions in import taxes on third countries.[1] With the average level of tariffs relatively low across much of the world, the attention of policy makers is increasingly turning towards non-tariff measures (NTMs), which include price or quantity controls, product standards, rules of origin and investment regulations. Curiously, both the number of PTAs and the average number of NTMs per product line have increased sharply in recent years (see Figure 1 and Figure 2).[2] Whereas NTMs entail a vast array of different regulations and are not necessarily implemented with protectionist motives, they come at a minimum with substantial compliance costs for firms, increased prices for consumers, reduced trade flows, and can in some instances shut down trade completely.[3] Despite the rising prominence of both PTAs and NTMs, it is unclear if and how these two phenomena are related.

In this paper, we empirically study the product-level (HS 6-digit) effects of importers' PTA exposure on NTMs using a sample of 83 countries over the period 2000 to 2017. Our analysis leverages the most comprehensive collection of NTM data to date, the UNCTAD NTM TRAINS Portal (UNCTAD 2024b), which has only recently become available for a continuous number of years and a large collection of countries. Methodologically, our core analysis examines the effect of the PTA share of imports in a product on the number of NTMs in place for said product, i.e., the NTM stock.[4] This approach allows us to capture whether products with greater import shares from PTA partners tend to be subject to more or fewer NTMs. To address the endogeneity of the PTA share, we follow Kuenzel and Sharma (2021) —who examine the theoretical and empirical linkages between PTAs and MFN tariffs rather than NTMs— and instrument the actual PTA share with

[1] See, for instance, Estevadeordal et al. (2008), Calvo-Pardo et al. (2009), Ketterer et al. (2014), Mai and Stoyanov (2015), and Kuenzel and Sharma (2021).

[2] The rise in NTMs has also been documented by, for instance, Felbermayr et al. (2017), UNESCAP (2019), and UNCTAD (2024a).

[3] See, for instance, Carrère and de Melo (2011), Ederington and Ruta (2016), and Kinzius et al. (2019). A recent analysis by The Economist estimates that a 50 percent increase in NTMs by high- and middle-income economies would decrease global GDP by 1.28 percent (Economist Impact 2024).

[4] The UNCTAD (2024b) data captures 16 separate NTM categories at the HS 6-digit level and contains information on when NTMs take effect and when they are revoked. We discuss in section 3 why the NTM count is preferable in our context over using ad valorem equivalents.

the PTA partners' product-specific share of exports to the rest of the world, which captures their propensity to export a particular product.[5] Moreover, we control for a saturated set of fixed effects to ensure that our estimates only exploit the variation over time at the importer-product level.

From a theoretical perspective, the effect of PTAs on NTMs is ambiguous and it is possible to think of reasons why PTAs might either increase or decrease the imposition of NTMs. For example, PTAs could encourage domestic import-competing firms to lobby harder for protection, and NTMs are the import-limiting instrument of choice for governments when faced with more limited policy space with respect to tariffs on account of multilateral and preferential agreements (see, for instance, Kuenzel 2023). On the flip side, PTAs create preferential rents for partner countries who may be more invested in preventing NTMs that would undermine their preferential advantage through lobbying, threats of retaliation or insisting on concessions in other dimensions of trade agreements. We provide below an overview of the different theoretical channels that could link PTAs and NTMs and empirically assess their predictions.

We find robust evidence that PTAs have a negative impact on countries' NTM stocks across a wide range of specifications. Our baseline estimates imply that a one standard deviation increase in the PTA import share contributes to .09 fewer imposed NTMs for a given HS 6-digit product, which is equivalent to 464 fewer NTMs across the total of around 5,000 products for a given importer in the HS nomenclature. These effects are similar for both NTMs imposed on PTA partners and non-PTA partners, which means PTAs contribute to multilateral liberalization with respect to NTMs. Exploring NTM subcategories,such as technical barriers to trade or quantity controls (see Table 2 for a complete list), we find a consistently negative effect for the most commonly used types of NTMs. Moreover, the negative effect of PTA exposure on NTMs is driven by products with higher preferential margins, the difference between MFN and preferential tariff rates. For products with preferential margins that exceed the respective median for a given importer, the magnitude of the PTA effect on NTMs is about 3.5 times as large as the baseline estimate. This pattern is consistent with a "rent preservation effect," whereby PTA partner countries seek to limit NTMs in order to preserve their preferential rents.

We explore a range of empirical extensions. Using an alternative specification that takes into account preferential and MFN tariff rates, we estimate that a PTA-induced tariff reduction of

[5] A variant of this instrumentation strategy has also been adopted by Ornelas and Tovar (2022). Broadly, our general approach is in the spirit of Autor et al. (2013) and Hummels et al. (2014) who predict bilateral imports using the exporting country's flows to elsewhere in the world.

one percentage point is associated with .13 fewer NTMs for a given product, or 670 fewer NTMs across all products. Hence, in the context of PTAs, tariffs and NTMs are complementary policy instruments. Examining heterogeneity across several dimensions, we find that the negative link between PTAs and NTMs is amplified for: (i) deeper agreements, which may provide more space for non-trade concessions to PTA partners — a channel similar in some respects to Limão (2007), (ii) "technical" NTMs, which in practice might be less politically sensitive due to their more objective nature, and (iii) advanced economies, which generally rely more heavily on NTMs in their protection structure.

Our work is related to a large number of studies that examine the effects of PTAs on MFN, i.e., non-member, tariffs. Much of the evidence suggests that PTAs are "building blocks" towards multilateral liberalization, leading to reduced tariffs on non-members (e.g., Estevadeordal et al. 2008, Calvo-Pardo et al. 2009, Ketterer et al. 2014, Mai and Stoyanov 2015, Kuenzel and Sharma 2021). This part of the literature often emphasizes lost tariff revenue due to PTAs as a motivator to also lower import taxes on outsiders. Limão (2006, 2007) and Karacaovali and Limão (2008), however find evidence that PTAs are "stumbling blocks" that hinder tariff reductions on non-members in the US and EU contexts, respectively. Our paper contributes to answering the broader question of how PTAs influence multilateral trade liberalization by examining the impact on NTMs. Our results imply that PTAs have a building block effect with regard to NTMs.

Our paper also adds to a rich literature that examines the determinants of non-tariff measures. Cross-country analyses of the subject typically emphasize the importance of political economy factors, such as economic size or domestic institutions, and the level of foreign competition for NTM incidence (e.g., most notably, Mansfield and Busch 1995 and Lee and Swagel 1997). Importantly, our fixed effects structure allows us to control for these factors and minimizes the exposure of our estimates to omitted variable bias. However, very few studies specifically examine the relationship between PTAs and NTMs, which in part is due to the lack of comprehensive NTM data that has not become available until fairly recently. Our paper fills this gap.

The existing research on the effects of PTAs on NTMs focuses on a specific subset of the latter in the form of anti-dumping (AD) actions, which historically feature a much better data coverage than most other NTMs. PTAs tend to reduce the number and/or duration of AD actions against member countries (Silberberger and Stender 2018, Prusa et al. 2022, Zhu and Prusa 2023). Speaking to the question of multilateral liberalization, Tabakis and Zanardi (2019) find that PTAs also lead to fewer AD measures against non-member countries. Relative to these studies, our approach focuses on a much wider range of NTMs beyond AD duties specifically. Temporary trade barriers, of which AD actions are a subset, account for only about 3.5 percent of all NTMs in our data. A paper that sheds light on the relationship between PTAs and NTMs more broadly is Cadot and Gourdon (2016) who estimate the effect of different NTMs on prices by leveraging an earlier version of the UNCTAD (2024b) data. They find that deep-integration clauses in preferential trade agreements temper the increase in prices caused by NTMs. In contrast to our paper, they do not examine the effect of preferential trade agreements on the imposition of NTMs but rather provide evidence on how PTAs can temper the price effects of NTMs.

In the next section, we lay out the theoretical linkages between PTAs and NTMs. Section 3 presents our empirical strategy, and section 4 discusses data sources and stylized NTM and PTA facts. Section 5 provides the baseline results and examines the empirical evidence for specific theoretical channels. In section 6, we consider several extensions and robustness checks of the baseline empirical model. Section 7 concludes.

2 PTAs and NTMs: Theoretical Linkages

This section discusses the theoretical channels through which the increased exposure to PTAs could affect the imposition of NTMs. We divide the discussion into "stumbling block" and "building block" channels, implying a positive or negative effect of PTAs on NTMs, respectively.[6] As we discuss below, some theories from the extensive literature on the effect of PTAs on MFN tariffs are readily applicable in our context while others are not.[7]

2.1 Stumbling Block Channels

We identify two theories that predict an increase in NTMs subsequent to PTA deals: (i) tariff-NTM substitution effects and (ii) non-trade objectives in the negotiation of PTAs.

[6] In our baseline specification, we measure NTMs independent of target countries. Our usage of the stumbling/building block terminology here is therefore broader than in the traditional tariff context, which focuses on the effects on non-PTA countries.

[7] For instance, a common explanation for a building block effect that would *not* extend to NTMs is the theory that PTA tariff reductions induce countries to lower MFN tariffs in order to limit needless tariff revenue losses on account of trade diversion (e.g., Estevadeordal et al. 2008 and Kuenzel and Sharma 2021). Limão (2016) provides an extended discussion of the literature on the effects of PTAs on tariffs.

2.1.1 Substitution Effects

The simplest possibility for an NTM-increasing effect of PTAs —and one that would be specific to NTMs— is that domestic import-competing firms will lobby to impose NTMs in place of the tariffs that have been reduced as a result of preferential trade deals. NTMs are harder for trade agreements to regulate and monitor compared to tariffs and may be used by governments to add protection when multilateral and preferential trade agreements limit the possibility of maintaining high tariffs. This mechanism is related to a large number of studies that probe whether tariffs and NTMs are substitutes. Kuenzel (2023) provides a recent overview of this literature and finds that countries have a general tendency to use more NTMs when faced with limited tariff policy space.

2.1.2 Non-trade Objectives

Limão (2007) provides another prominent stumbling block theory in the context of the effect of PTAs on MFN tariffs, which could also apply to NTMs. Specifically, countries have an incentive to keep MFN tariffs high in order to incentivize PTA partners to provide non-trade concessions as part of deep PTAs, e.g., the establishment of a military base or diplomatic support in other venues. A similar mechanism could be at work in our context that could incentivize countries to retain NTMs on non-PTA partners but to reduce them for PTA partners. We examine this prediction below and find that in practice PTAs do not change NTM patterns in this manner. NTMs are mostly applied across the board and any targeting usually arises because certain NTMs are only imposed on some specific partners, e.g., anti-dumping duties, and not that specific partners are being exempted, perhaps due to legal or administrative challenges.

2.2 Building Block Channels

There are at least three separate theoretical mechanisms that can motivate a negative impact of PTAs on NTM usage: (i) juggernaut effects shrinking domestic import-competing industries, (ii) PTA-induced rent destruction effects for domestic firms, and (iii) rent-preservation incentives for PTA partners.

2.2.1 Juggernaut Effects

The juggernaut theory (e.g., Baldwin and Robert-Nicoud 2015) predicts that PTAs will lower MFN tariffs as these deals reduce the size and therefore political influence of domestic import-competing industries and at the same time increase the political influence of exporting industries. The same channel could be at work with regards to NTM usage. The shrinkage of domestic import-competing industries reduces the political influence of protection-seeking industries, causing in turn a reduction in multilateral non-tariff barriers over time as well. Similarly, exporting industries will push for more liberalization in order to reduce the threat of retaliation and non-cooperation by partner countries. The reduction in multilateral barriers further diminishes the size of import-competing industries and expands exporting industries, leading to a snowball effect that keeps deepening liberalization across the board. We test this potential mechanism in section 5.

2.2.2 Rent Destruction Effects

A related but distinct mechanism for how PTAs could induce multilateral trade liberalization is the rent destruction effect proposed by Ornelas (2005). According to this mechanism, PTAs lower intra-bloc trade barriers and in doing so reduce the incentives of import-competing industries to lobby for higher external tariffs. Intuitively, the lobbying efforts by domestic industries to maintain external tariffs would be less fruitful if there are other exporters already exempted from these tariffs on account of PTAs. In addition, benefits from these lobbying efforts would accrue in part to these foreign PTA exporters and not only to domestic industries. Ketterer et al. (2014) provide empirical evidence for this channel in the context of the Canada US free trade agreement (CUSFTA). The same building block effects could also apply to NTMs provided there is enough scope for implementing non-tariff barriers that are specifically targeting non-PTA partners. PTAs would then reduce domestic import-competing industries' incentives to lobby to keep these NTMs high because part of the lobbying benefit accrues to the PTA partners' exporting firms. In this case, we should specifically observe fewer NTMs applied on non-preferential partners. We examine the potential differential impacts of PTAs on NTMs by partner/non-partner countries in section 5 below, which allows us to test for the presence of the rent destruction effect.

2.2.3 Rent Preservation Effects

Finally, foreshadowing our empirical results, we especially emphasize a third possibility for a building block effect that is connected to a rent preservation mechanism for PTA partners. Subsequent to a PTA, partner countries enjoy preferential access to an importer's market that results in additional rents for the partners' exporting firms. NTMs that are applied across the board can undermine these rents to a substantial degree. Since partner countries' welfare will be harmed from these

NTMs, they have an incentive to prevent new NTMs from being imposed and to encourage the removal of existing NTMs. Hence, to prevent harm from NTMs that undermine their preferential market access, partner country firms could lobby the domestic government directly to lower NTMs. Similarly, the partner country government might attempt to limit NTMs in the importing country through threats of retaliation. Echoing the argument by Limão (2007), partner countries could also insist on non-trade concessions —perhaps through additional provisions as part of a deeper PTA— or withhold cooperation in other areas.

We provide a simple three-country model in Appendix A to illustrate this rent preservation mechanism in more detail. The model shows that the amount the PTA partner industry would be willing to pay in order to prevent NTMs from being applied on a product would be higher when: (i) the PTA partner has a stronger comparative advantage in that product (which shows up as a higher share of imports into the destination market) and (ii) the MFN tariff is higher relative to the preferential rate. Both of these factors translate into higher profits for the PTA partners' exporters and therefore incentivize greater lobbying activity to protect these rents. In section 5, we specifically test how the PTA effect on NTMs differs based on the preferential margin, the difference between MFN and PTA tariff rates.

3 Empirical Model

A key component of our empirical analysis is a novel NTM measure that we construct using data from UNCTAD (2024b), which has recently become available and provides the most comprehensive NTM collection in terms of country, year and product coverage to date. We measure countries' NTM usage intensity at the product level by compiling a count measure of the NTM stock that each importer has in place during a given period for each HS 6-digit product. We use NTM counts rather than ad-valorem equivalents (AVEs) for our analysis because changes in the NTM count directly capture policy responses whereas AVEs could change for a variety of reasons (even in the absence of policy changes) and so are harder to interpret. For instance, changes in demand patterns or exchange rates could be confounding factors. Furthermore, AVE estimates tend to be noisy at the product level and are subject to endogeneity concerns that are challenging to fully address.[8] In section 6, we also provide estimates by NTM subcategory to examine how our results differ across

[8] Disdier and Fugazza (2019) provide an overview of the existing approaches to the AVE estimation of NTMs and the associated empirical and theoretical challenges. In section 5, we discuss how to use existing AVE estimates to provide a back-of-the-envelope calculation of implied AVE impacts based on our results.

different types of NTMs, e.g., quantity controls versus product standards.

To determine the impact of a country's PTA exposure on its NTM choices, we estimate the following baseline model at the importer-year-HS6 level:

$$NTM_{ist} = \alpha_{it} + \alpha_{is} + \alpha_{st} + \beta PTAshare_{ist-1} + \epsilon_{ist} \quad , \tag{1}$$

where NTM_{ist} is the NTM count that country i has in place for HS 6-digit product s in year t. $PTAshare_{ist}$ is the import share accounted for by country i's PTA partners in product s in year t. We use a one-period lag of the PTA share measure to account for the fact that PTA effects on NTM policies might take some time to fully unfold. Based on the theoretical discussion above, $\beta < 0$ would show a building block effect of PTAs on NTMs, whereas $\beta > 0$ would indicate a stumbling block effect. The above specification accounts for importer-year (α_{it}), importer-product (α_{is}) and product-year fixed effects (α_{st}), implying that the variation we exploit comes purely from the within-country product level over time. The extensive fixed effects structure controls for unobserved heterogeneity and the potential impact of a wide set of third variables, such as industry-specific demands for protection and macroeconomic determinants of NTMs and PTA shares. Importantly, these fixed effects capture the determinants emphasized in the existing cross-country studies on NTM incidence, as well as any aggregate relationships between PTAs and NTMs (e.g., the NTM stock affecting the choice of potential PTA partners or the scope of PTA negotiations).

Estimating equation (1) by OLS will not recover an unbiased estimate of β due to the interdependence of a country's PTA share and NTM policies. First, there could be reverse causality whereby NTM policies could affect the PTA share. Second, the same economic and political factors, such as lobbying pressures or comparative advantages, that drive PTA negotiations could also directly affect NTM choices. To extract the causal impact of PTAs on NTMs, we therefore instrument the PTA import share variable, $PTAshare_{ist-1}$, by estimating the following first-stage regression:

$$PTAshare_{ist-1} = \alpha_{it-1} + \alpha_{is} + \alpha_{st-1} + \gamma PS_{ist-1} + \mu_{ist-1} \quad . \tag{2}$$

PS_{ist} is the *predicted PTA share* and captures the share of exports to the rest of the world (i.e., excluding country i) that is accounted for by the PTA partners of country i in product s in year t:

$$PS_{ist} = \frac{\sum_{j \in PTA_i} \sum_{k \neq i} X_{jkst}}{\sum_j \sum_{k \neq i} X_{jkst}} \quad ,$$

where X_{jkst} are the exports of product s from exporter j to importer k in year t and PTA_i is the set of countries that are PTA partners with i. The denominator of this share is the sum of all exports of product s to all destinations except for i, whereas the numerator is the sum of all such exports specifically by the partners of country i. Intuitively, the predicted PTA share measures the supply-side factors that importer i faces in product p from its PTA partners, for instance, due to patterns of their comparative advantage. Hence, the PS variable captures the likelihood of PTA partners exporting to country i at the product level. Importantly, the predicted PTA shares should not affect country i's NTM choices except through its impact on the actual PTA import share. This approach is conceptually justified as long as the countries in the sample are small enough to have a negligible impact on the global export patterns of their partners. Below we provide robustness tests that drop observations of importing countries which could potentially be considered as having a substantial impact on world trade patterns in a particular product.

The instrument we use here is the same as in Kuenzel and Sharma (2021), who consider the impact of PTAs on the tariffs faced by non-member countries. However, our outcome variable in the form of NTM stocks is a new concept in the literature. More generally, our instrumentation strategy is in line with an increasing number of studies that use exporters' trade flows to other locations to predict a country's imports. For instance, Autor et al. (2013) and several of their subsequent studies consider the US local labor markets effects of Chinese imports and instrument the latter using China's exports to other advanced economies. Hummels et al. (2014) use information on countries' exports to the rest of the world to construct an instrument for firm-level offshoring in Denmark. Our empirical strategy is also related to Saggi et al. (2018) who employ a sectoral gravity model to generate predicted import shares. Lastly, Ornelas and Tovar (2022) use PTA partner exports to the rest of the world to predict bilateral preferential imports.

Note that we use a linear model for our analysis as we are accounting for an extensive set of fixed effects together with an instrumental variable. Non-linear estimation approaches, such as count models, are typically subject to the incidental parameters problem (IPP) in the presence of many fixed effects. The Poisson-Pseudo Maximum Likelihood (PPML) estimator is an exception and is, for example, robust to the inclusion of two-way fixed effects (Fernández-Val and Weidner 2016). However, PPML would not be suitable in our context for two reasons. First and most importantly, the PPML estimator is not robust to the IPP in an IV environment (Jochmans 2022). Second, our fixed effects structure is more detailed than a two-way fixed effects model and the IPP robustness of

PPML will not necessarily hold in this context even in the absence of an IV.[9]

Beyond the baseline level model in (1), we also implement two alternative difference specifications that allow us to control for importer-product characteristics without importer-product fixed effects. First, we use a short difference (SD) over adjacent periods to exploit the variation in short-run changes in the PTA share to identify the latter's impact on NTM usage:

$$\Delta NTM_{ist} = \alpha_{it} + \alpha_{st} + \beta_{SD} \Delta PTAshare_{ist-1} + \epsilon_{ist} \tag{3}$$

Second, we employ a long difference (LD) specification that focuses on the change over the entire 2000-2017 period:

$$\Delta_{15} NTM_{ist} = \alpha_i + \alpha_s + \beta_{LD} \Delta_{15} PTAshare_{ist-1} + \epsilon_{ist} \tag{4}$$

In addition to PTA shares, the exposure of a product to PTAs would in practice also depend on the MFN and preferential tariff rates in that product. To account for this possibility, we therefore implement a second empirical model that uses as PTA exposure measure the import-weighted applied tariff, WT, importers impose on every product:

$$NTM_{ist} = \alpha_{it} + \alpha_{is} + \alpha_{st} + \beta WT_{ist-1} + \epsilon_{ist} \quad . \tag{5}$$

Specifically, the weighted tariff measure is defined as

$$WT_{ist-1} = \sum_{j=1}^{J} w_{ijst-1} T_{ijst-1}$$

where w_{ijst-1} describes each exporter j's respective share in product s imports in country i in year $t-1$ and T_{ijst-1} is the corresponding tariff rate imposed by country i on exporter j.

A greater PTA import share mechanically lowers a country's weighted applied tariff.[10] Hence, if increased PTA exposure lowers NTMs, we should expect that lower levels of the WT measure

[9] Weidner and Zylkin (2021) study a three-way fixed effects gravity model (without IV) and find that PPML is consistent but asymptotically biased, and adjustments are required for correct inference. As we are not studying a gravity model, the results or adjustments from Weidner and Zylkin (2021) would not be applicable to our setting even apart from the separate IV issue.

[10] Suppose that, in ad valorem terms, the MFN tariff for a product is 0.10, the preferential rate is equal to 0, and the PTA share increases from an initial share of 0.25 to 0.50. In this case, the initial value of our weighted tariff measure would be: $0 \times 0.25 + 0.10 \times 0.75 = 0.075$. After the PTA share increases, the weighted tariff would be: $0 \times 0.50 + 0.10 \times 0.50 = 0.050$.

also lead to a decrease in product-specific NTMs, or $\beta > 0$ in equation (5). More generally, the model in equation (5) allows us to test whether countries use NTMs and tariffs as complements or substitutes, a long-debated question in the literature. A positive impact of the weighted tariff measure on NTMs would imply that countries do not use NTMs to reverse PTA-induced tariff cuts, which would be evidence against the substitution effect discussed in section 2.1.1. Beyond the identification concerns mentioned above, the tariff rates themselves are likely to be endogenous. Some of the factors that affect a country's tariff rate choices might also have an impact on decisions surrounding NTMs. For example, a strong domestic lobby in a particular industry might press for higher protection against all exporting countries, thereby affecting both NTM levels and tariff rates. To address these concerns, we again instrument WT with the predicted PTA share variable, PS.

4 Data

4.1 Data Sources and Sample Composition

Our empirical analysis requires HS 6-digit level data on PTA shares, preferential as well as MFN tariffs, and NTMs. To calculate the PTA and predicted PTA shares, we obtain PTA formation dates and information on respective member countries from Mario Larch's updated Regional Trade Agreements Database (Egger and Larch 2008). Trade data at the HS 6-digit level comes from CEPII's version of Comtrade data (CEPII 2023). CEPII uses a systematic procedure to weigh the usage of either importer- or exporter-reported data based on the estimated reliability of their provided data (including adjustments for f.o.b. and c.i.f. differences).

Our main source for tariff rates is the updated MacMap-HS6 database compiled by the International Trade Center and CEPII (CEPII 2012). The MacMap-HS6 data contains ad valorem tariff rates for a large number of countries and carefully accounts for each importer's preferential trade agreements. The MacMap-HS6 tariff data is available in the form of three-year averages for the years 2000-2002, 2003-2005, 2006-2008, 2009-2011, 2012-2014 and 2015-2017.[11] To work with a consistent sample, we also use three-year averages of the actual and predicted PTA share variables in the analysis. Our final sample therefore includes six periods covering the 2000-2017 time frame.

The above referenced UNCTAD NTM database (UNCTAD 2024b) provides us with NTM information for 16 separate categories going back to the 1970s. For each NTM, the database lists the imposing country, the countries affected by the measure, the implementation date, the repeal date

[11] We will be referring to the middle year to describe each period throughout, e.g., 2001 for the period 2000-2002.

(if applicable), and a brief description. Importantly, the UNCTAD researchers include the applicable HS code(s) for each NTM, which allows us to match the NTM information to product-level trade and tariff data. In our baseline specification in equation (1), we count up NTMs indiscriminately across all 16 NTM categories and independently of how many exporters are targeted, i.e., each NTM measure counts as one whether it targets all countries or only a subset of exporters. We also examine below the robustness of the results when distinguishing between different types of NTMs and how broadly they apply to trading partners. As our sample starts in 2000, our data uses the HS1996 version of the HS nomenclature. As indicated in equation (1), to account for potential information lags, we always use the NTM count in the first year of the subsequent period.

We impose a number of restrictions on the sample to minimize the impact of outliers. First, we drop small countries with a population of less than one million. Second, we exclude the top one percent of observations in terms of NTM counts, which effectively eliminates products with NTM counts of 50 or more. Lastly, to ensure sufficient and relevant variation in PTA shares, we focus on countries with at least one new PTA during the 2000-2017 period. Our final sample includes 83 countries and 2,342,442 observations (with 392,838 country-product combinations).[12] As we discuss in section 5.1, the results are similar when these sample restrictions are relaxed. Table B1 in Appendix B provides a list of the countries in the sample.

4.2 Stylized Facts

Table 1 provides variable definitions and summary statistics for all variables used in the empirical analysis. The average NTM count per product in the sample is 3.419. However, this number masks a substantial amount of heterogeneity across importers, time, products, and the types of NTMs that countries actually deploy. First, as shown in Figure 3, the actual number of NTMs in our sample varies widely at the importer-product level. 50 percent of observations are not subject to any NTM, 40 percent feature between 1 and 10 NTMs, 8 percent are subject to 11 to 25 NTMs, and the remaining 2 percent have an NTM count between 26 and 49. Second, the average number of NTMs per HS 6-digit product rises from 1.847 in 2001 to 5.181 in 2016. Panel a. in Figure 2 shows that this increase in NTMs can be observed both in advanced and developing countries, although the average level of NTMs is general higher in the former.

Third, as illustrated by panel b. in Figure 2, the average NTM counts differ substantially across

[12] We include the European Union as a single entity and therefore only use extra-EU trade in the computation of the PTA import shares and the PS measure.

product groups. Agricultural products (HS1-24) are by a large margin subject to the highest number of NTMs. Chemical products (HS28-40), textiles (HS50-67), manufactured goods (HS84-97), raw materials (HS25-27, HS41-49, HS68-71) follow in terms of average NTM incidence. Lastly, metal products (HS72-83) are covered by the lowest number of NTMs. Importantly, we observe a rise in the average level of NTMs over the sample period across all product groups. Note that although the exposure to NTMs differs across product groups, the fixed effects structure in our regression analysis ensures that our estimates are identified from within-country product variation over time only.

Table 2 provides an overview of the 16 different NTM categories and how their average incidence per product line is distributed in our sample. Three observations stand out. First, 9 out of the 16 NTM subcategories have, on average, fewer than .05 NTMs in place in both 2001 and 2016. That is, the NTM stock is fairly low in most categories. Second, in both the 2001 and 2016 periods, just three categories account for about 70 percent of all NTMs: sanitary and phytosanitary measures (SPS), technical barriers to trade (TBT), and export-related measures. Lastly, 12 out of the 16 NTM categories exhibit increases in their stock from 2001 to 2016, with many more than doubling or tripling in incidence levels.

Our main independent variables of interest are the PTA import share and the weighted applied tariff. Over the sample period, there has been a substantial shift in trade patterns towards PTA partners, which is reflected in both variables. Figure 1 shows that the average PTA import share has significantly increased over the sample period from 23.9 percent in 2001 to 37.5 percent in 2016. This increase would include both changes due to the formation of new PTAs as well as increased trade with existing PTA partners. We disentangle these two channels in some of our regression specifications. We also note that the average applied tariff decreased from 8.4 to 5.4 percent, a trend that at least partly reflects the effect of PTAs.

5 Results

In this part, we provide the baseline estimates of the empirical models outlined in section 3. Moreover, we explore potential mechanisms that can explain the effect of PTA exposure on NTMs.

5.1 Baseline Results

5.1.1 PTA Share Estimates

Table 3 presents the second-stage results from the IV regressions of the NTM count on the PTA share instrumented by the predicted PTA share. Note that we cluster standard errors throughout at the importer/HS 6-digit level to account for the potential correlation between PTA share and NTM decisions on the importer-product level over time. Column (1) provides the level specification estimates corresponding to the model in equation (1), which includes importer-year, importer-product and product-year fixed effects. The estimated coefficient is negative and statistically significant at the one percent level. The point estimate implies that a 10 percentage point increase in the PTA share leads to about 0.0265 fewer NTMs at the product-level. Expressed differently, a one standard deviation (.350) increase in the PTA share lowers the product-level NTM stock by about 0.093, which would correspond to a total of 465 fewer NTMs across all HS 6-digit products (about 5,000) of a given importer.

Columns (2) and (3) in Table 3 show the alternative short (3 years) and long (15 years) difference specifications, corresponding to the models in equations (3) and (4), respectively . These specifications include importer-year and product-year fixed effects, with the importer-product fixed effects being eliminated through the differencing procedure. The estimates in both cases are broadly similar in terms of magnitude and statistical significance to the level specification in column (1). Hence, Table 3 provides evidence that countries and products with greater exposure to imports from PTA partners will reduce, or at least temper, the growth of NTMs. The bottom of Table 3 provides for each specification the corresponding first-stage F-statistic. The F-statistics are large throughout, implying a strong predictive power of the predicted PTA share on the actual PTA share in the first-stage regressions. This pattern holds for both the level and difference regressions.

The first three columns of Table B2 in Appendix B show the full first-stage regressions. We see that the actual coefficients on the predicted PTA share variable are between 0.74-0.84 depending on the specification, which shows how directly the predicted PTA share translates into the actual share, even after accounting for a saturated set of fixed effects. The first three columns in Table B3 in Appendix B report the corresponding OLS results, where the implied effect of PTAs on NTMs is either modestly positive or zero. Comparing the OLS results to the corresponding IV specifications in Table 3, we see an implied positive bias in the OLS regressions. One explanation for this direction of bias is reverse causality whereby NTMs increase the PTA share. Such an effect would be consistent with Cadot and Gourdon (2016), who show that while NTMs increase prices for both PTA partners and non-partners, the price increase for PTA partners is smaller than for non-partners. Our instrumental variable strategy overcomes this reverse causality.

We conduct a number of robustness tests of the results in Table 3. The PTA share effect on NTMs is similar when we individually and collectively relax the country sample restrictions discussed in section 4.1; Table B4 in Appendix B reports these results. We also implement two placebo tests to examine the validity of the exclusion restriction in our instrumentation approach. The first column in Table B5 shows short-difference estimates that use the lagged change in PTA exposure (instrumented with the change in the predicted PTA share from the same period) to explain the prior period's short difference in NTM outcomes (instead of next period's change in the NTM stock). The second column in Table B5 uses the change in PTA exposure from the next period (instrumented with the change in the predicted PTA share from the same period) to estimate the impact on the current period's change in the NTM stock. In both cases the estimates from these placebo tests are either statistically indistinguishable from zero or positive but close to zero, alleviating concerns about a potential violation of the exclusion restriction.

Moreover, in Table B6 in Appendix B, we also provide estimates when successively dropping importer-product observations that account for more than 20, 10 and 5 percent of world imports in a given product, respectively. These results are very similar to the baseline estimates in Table 3, indicating that the instrumentation approach is not affected by countries that could potentially have an impact on global export patterns. Similarly, we also conduct a "leave-one-partner-out" test to examine if supply-side dominance from large PTA partners is driving the results. In Table B7, we exclude for each importer the largest respective PTA exporter (as measured in the initial period of our sample) in calculating the actual and predicted PTA share measures. The resulting estimates are again similar to our baseline in Table 3.

The results in Table 3 use an unweighted sum of NTMs independent of how many countries and imports are actually targeted with any given NTM. However, our results are similar when we use trade-weighted NTM stocks based on countries' bilateral imports at the HS6-digit level prior to our first sample period (1997-1999). Table B8 in Appendix B shows these estimates. Moreover, we also repeat our analysis using gross NTM flows instead of stocks. That is, the level specification then captures how many new NTMs are added over the next period, while the SD and LD specifications capture changes in NTM flows from period to period and changes over the entire 2000-2017 sample period, respectively. The first three columns in Table Table B9 in Appendix B shows unweighted results using these gross NTM flows whereas the last three columns show estimates when using instead trade-weighted gross NTM flows. In both cases, the results are again similar to the baseline estimates reported in Table 3.

5.1.2 Weighted Tariff Estimates

Table 4 shows results for the alternative specification outlined in equation (5), where we use the weighted applied tariff (WT) in place of the PTA share as the independent variable. We instrument the WT measure again with the predicted PTA share. In this specification, an increase in the PTA share would lower the weighted applied tariff as long as PTA tariffs are lower than MFN tariffs. This specification therefore explicitly takes into account the actual tariff rates, which is important to the extent that PTAs might not actually reduce tariffs on certain products. Moreover, with this alternative model we can obtain the effect of PTA-induced tariff reductions on NTMs, allowing for a direct comparison with the past literature on PTAs and MFN tariffs. Consistent with our PTA share results, both the level and difference specifications in Table 4 show that a lower weighted tariff leads to fewer NTMs. These effects are statistically significant at the one percent level throughout.

In our sample, the median MFN and preferential tariff rates are 7 percent and 0 percent, respectively. A one standard deviation increase in the PTA share (.350) then translates to a $-0.350 \times .07 = -0.0245$, or 2.45 percentage point, reduction in the WT measure for the median product in the sample. For the level specification, the magnitude of the coefficient therefore implies that a one standard deviation rise in the product-level PTA share leads to about .326 ($= -.0245 \times 13.318$) fewer NTMs for a given product. The magnitude of this effect is slightly larger compared to the PTA share regressions, which could be explained by the fact that the weighted applied tariff measure captures more completely a countries' exposure to PTAs. To conserve space, we will focus on the PTA share results going forward. However, the WT measure estimates paint a very a similar picture and are available upon request.

5.1.3 Ad Valorem Equivalents of NTM Count Effects

There is a large number of studies that focus on estimating ad valorem equivalents (AVEs) for NTMs.[13] As discussed earlier, in our context, it is preferable to focus on counts of NTMs as the dependent variable. Nevertheless, we can use existing AVE estimates from the literature to calculate

[13] Prominent examples include Kee et al. (2009), Beghin et al. (2015), Cadot et al. (2015) and Kee and Nicita (2022).

the implied ad valorem tariff effects of the above NTM count results. Note that much of the AVE estimation literature for NTMs uses a binary variable to capture the presence of NTMs, and relatively few papers estimate AVEs by using NTM counts (e.g., Ing and Cadot 2017, Kravchenko et al. 2022), which are more applicable to our analysis. Kravchenko et al. (2022) provide importer-sector level NTM counts and AVE estimates for GTAP industries that allow us to calculate an AVE correspondence for each NTM. Specifically, using their data, we first compute the ratio of the ad valorem equivalent tariff to the NTM count at the importer-industry-level. In a second step, using these ratios and import trade data, we then calculate the global trade-weighted average AVE per NTM. This procedure gives us an AVE per NTM correspondence of about 5%.[14]

This value can be used to translate our results into ad valorem tariff effects. As noted earlier, specification (1) in Table 3 implies that a one standard deviation increase in the PTA share lowers the product-level NTM count by .093. The estimated reduction in the ad valorem equivalent tariff would then be $.093 \times .05 = .005$, or .5 percentage points. For products with higher than median preferential margins, which drive our results as discussed below in section 5.2.1, the implied ad valorem tariff effect would rise to over 1.5 percentage points, assuming the same AVE per NTM for these products. We emphasize that these are, of course, back-of-the-envelope calculations. Given the very wide heterogeneity in estimated AVEs across products, the effects could be substantially larger for some products and much smaller or close to zero for others.

In Table 5, we report additional AVE estimates differentiated by broad industries (that aggregate the basic GTAP industries) and calculate for each the implied trade impact of a one standard deviation increase in the PTA import share. We generate the AVE per NTM estimates by sector in the first column of Table 5 by using value-weighted averages of the AVEs per NTM calculated from Kravchenko et al. (2022). In a second step, we obtain value-weighted trade elasticities for these industry groups from Fontagné et al. (2022). Finally, we compute the trade impact estimates in the third column of Table 5 by multiplying -0.093, the estimated reduction in the NTM count based on specification (1) in Table 3 from a one standard deviation increase in the PTA import share, with the product of the first two columns. The estimates in column (3) of Table 5 then allow us to compare the predicted trade increases across different sectors from NTM reductions induced by a one standard deviation increase in PTA exposure. The predicted trade surges show substantial

[14] Kravchenko et al. (2022) apply a hyperbolic tangent transformation to the AVEs in order to obtain values that are not implausibly large due to the presence of outliers. In order to obtain an average AVE per NTM ratio that is not implausibly large, we apply the hyperbolic tangent transformation directly to the ratio rather than to the AVEs. We use the same procedure in the compilation of Table 5 below.

heterogeneity, with basic metals and chemical & mineral products experiencing the largest trade increases due to PTA-induced NTM reductions with 11.494% and 8.345%, respectively. Most other sectors show trade increases between 1% and 4%, except energy & mining and utilities, transport & services. The latter sectors are less sensitive to PTA-induced NTM reductions as they simply feature very small estimated AVEs per NTMs.

5.1.4 Target Breadth of NTMs

In the analysis above, we equally counted any NTM imposed by an importer independent of how many countries are actually targeted. For instance, certain NTMs like anti-dumping duties usually only affect a subset of countries. In this part, we investigate if the PTA share effect on NTMs varies by the target breadth of the implemented NTMs. In Table 6, we distinguish the NTM count by whether a given NTM is targeting all countries ('World') or whether only a specific subset of nations is affected ('Specific Countries'). Note that over the sample period, around 85 percent of all product-level NTMs targeted all countries, and the remainder affected only a subset of an importer's trading partners.

Specifications (1) to (3) in Table 6 show the level and difference estimates when using the count of NTMs targeting all countries as dependent variable. Columns (4) to (6) in turn use the count of NTMs that target specific countries. On the whole, we see a consistent negative effect of the PTA share on NTMs across both groups. These estimates are statistically significant at the one percent level, except for the long-difference specification with 'World' NTM targets. Importantly, these results confirm that PTAs reduce both broad and more targeted NTMs. In line with the results in Table 6, importers reduce NTMs across the board as a result of increasing PTA import shares. Hence, when focusing on NTMs, PTAs contribute towards multilateral liberalization, since they reduce the number of non-tariff barriers imposed on non-member countries.

Overall, these results suggest that it is difficult to design NTMs in a very targeted fashion in practice, perhaps due to legal or administrative challenges. As noted above, this pattern is also consistent with the stylized facts from the NTM data, which show relatively limited targeting. As a result, when PTAs generate incentives to reduce NTMs, these reductions are applied broadly.

5.2 Exploring Potential Mechanisms

In this part, we explore the evidence for the three mechanisms predicting a negative link between PTAs and NTMs that we outlined in section 2.2: (i) rent preservation effects, (ii) juggernaut effects, and (iii) rent destruction effects.

5.2.1 Rent Preservation Effects

One possibility for why PTAs could reduce NTMs is that PTA partners have a strong incentive to prevent the imposition of NTMs, which would lower the rents from their preferential tariff advantage. This channel should matter more with a higher import share accounted for by PTA partners, implying a negative effect of the PTA share variable on a country's NTM stock. We provide a theoretical model in Appendix A showing that a PTA partner's potential benefits from limiting NTMs are larger when preferential tariffs are low relative to the corresponding MFN rates. To test this theory directly, we can split the sample based on the size of the product-level preferential margin, i.e., the difference between the MFN and PTA tariffs, and re-estimate the baseline specification in Table 3.

Table 7 reports the results from this split. The respective samples in the 'High' preferential margin categories in columns (1), (3) and (5) contain the observations for which the maximum product-level preferential margin, i.e., the difference between the MFN tariff and the minimum preferential tariff for a importer-product-year observation, is greater than the median preferential margin for the respective country in that year. In turn, the 'Low' preferential margin categories in specifications (2), (4) and (6) include observations with preferential margins below or at the median value of each respective importer in a given year.[15]

The estimates for both the level and difference specifications in Table 7 show throughout that the negative effect of the PTA share on NTMs is purely driven by high preferential margin products. The estimates for the high preferential margin samples are throughout about 3.5 times larger than in Table 3. Moreover, they are estimated very precisely and statistically significant at the one percent level across all specifications, whereas the coefficients for the low preferential margin specifications are either statistically not different from zero or even positive. The bottom of Table 7 also reports p-values from coefficient equality tests for all three pairs of estimates. In all cases, we can reject at the one percent level of statistical significance that the PTA share effect on NTMs is identical across high and low preferential margin sectors. The first-stage F-statistics are again very high across all specifications for both sample categories. Overall, the results in Table 7 provide support for the

[15] The observations in Table 7 differ between the "high" and "low" sample cuts as a considerable number of preferential margins equal the respective median values at the importer-year level, with the majority of these cases being due to zero preferential margins. We assign observations that equal the median to the "low" sample.

idea that NTMs may be reduced (or not imposed) in accordance with the PTA partners' incentives to intervene against additional trade barriers.[16]

Table B11 in Appendix B shows an alternative version of this approach that splits the sample based on high versus low initial (year 2001) MFN tariffs rather than preferential margins. These results also confirm what we see from the preferential margin split in Table 7. The negative effect of PTA shares on NTMs is driven by importer-product observations with high MFN tariffs. Deardorff and Sharma (2021) show that PTA tariffs are zero in about 80% of cases, so it is not surprising that splits based on preferential margins and MFN tariffs yield very similar results.

5.2.2 Juggernaut Effects

The presence of domestic political economy motives could play an important role in intermediating the effect of PTAs on NTMs. One possibility (discussed in section 2.1.1 as substitution effects) is that these industries might lobby to ensure that more NTMs are imposed on both PTA and non-PTA partners. However, substitution effects would be inconsistent with our central finding of an inverse relationship between PTAs and NTMs. A second possibility is a juggernaut-type effect, whereby the PTA would shrink domestic import-competing industries, weakening in turn their political power and ultimately leading to fewer trade restrictions in the form of NTMs. The juggernaut theory also implies that trade liberalization would increase the political influence of exporting industries who have an incentive to encourage policies that limit the likelihood of retaliation by trading partners. This theory could therefore provide an additional explanation for the negative baseline effect we observe.

Unfortunately, we cannot directly measure the size of domestic industries at the HS 6-digit level. However, we can test the juggernaut theory by examining its secondary implication, i.e., whether PTAs reduce (or limit the growth of) NTMs more for more export-oriented products. If the juggernaut-type effect can explain the negative impact of PTAs on NTMs, we should then expect that products with more exports should experience a more negative effect of PTA shares on NTMs. In Table 8, we split the level and difference samples based on an importer's exports in the respective HS 6-digit product. Specifically, we allocate HS 6-digit products to the 'High' sample if the respective country's share in total exports of said goods is higher than the median level across

[16] Table B10 in Appendix B shows that the same results pattern across high and low preferential margin samples is present for both NTMs targeting PTA and non-PTA partners, highlighting again the non-discriminatory nature of many NTMs. However, the magnitude of the NTM-reducing effects of PTA import shares in high-preferential margin products is greater for NTMs faced by PTA partners relative to non-PTA partners.

all HS 6-digit sectors and countries during the sample period. Similarly, we categorize a country's HS 6-digit products in the 'Low' export share category if their respective exports are at or below this threshold.

Looking across the three sample splits in Table 8, we cannot detect a clear pattern supporting the juggernaut theory. In both the level and short-difference specifications the magnitude of the PTA share estimate is greater for the 'High' export share category. However, the p-values for the coefficient equality test at the bottom of Table 8 show that we can only reject the hypothesis of identical PTA share estimates across the 'High' and 'Low' export share categories for the first-difference specification. Overall, there is no consistent evidence in favor of a juggernaut-type effect from Table 8. Of course, we should add the caveat that given the data limitations this test does not completely rule out the possibility of a juggernaut effect.[17]

5.2.3 Rent Destruction Effects

The last theoretical reason why PTAs could negatively affect NTMs is the rent destruction effect discussed in section 2.2.2. PTAs can lower the incentive for domestic firms to lobby for any NTMs that are applied only against non-PTA partners as the resulting rents would have to be shared with producers in other PTA member countries. This channel could explain a negative effect of PTA exposure on NTMs but would imply that the negative link should be concentrated in NTMs that affect non-PTA member countries. To test this prediction, we therefore separate NTMs in Table 9 by whether they target PTA and non-PTA members.[18] Specifications (1) to (3) provide the PTA share results when using the count of NTMs imposed on PTA partners, whereas columns (4) to (6) focus on the number of NTMs faced by non-PTA partners.

Two patterns emerge from Table 9. First, the PTA share has throughout a negative impact on the NTM counts for both PTA and non-PTA partners. These estimates are significant at the one percent level for the level and difference specifications in each case. Second, whereas the point estimates are similar across both the PTA and the non-PTA NTMs, the magnitudes are actually slightly larger for PTA partner NTMs. Hence, the evidence in Table 9 does not support the notion that the negative impact of PTAs on NTMs is driven by non-PTA NTMs as suggested by the rent

[17] We also explored using HS 4-digit industry-level statistics from the United Nations Industrial Development Organization to proxy for domestic industry size. We found inconclusive results in that case as well. However, the limited data availability across countries and time in the UN data substantially shrinks the sample sizes. These estimates are available upon request.

[18] When an NTM is imposed on all trading partners, we count them in both categories.

destruction effect. Altogether, only the rent preservation effect as captured by preferential margins is substantiated by our empirical analysis.

6 Extensions and Robustness Tests

In this part, we consider several additional specifications that further examine the heterogeneity of the PTA share effect on NTMs and test the robustness of the baseline results across different subsamples. Specifically, we consider the strength of the PTA-NTM link across (i) various degrees of PTA depth, (ii) different NTM subcategories, and (iii) importer income levels.

6.1 PTA Depth

As we discuss in section 2, there are several reasons why the incentives of a country's PTA partners could matter for a country's NTM policy. For instance, firms in partner countries could directly lobby to prevent the imposition of NTMs or the partner country government could threaten retaliation that would limit access to its market. Another limiting factor for the imposition of NTMs could be that partner countries might withhold cooperation in various non-tariff or non-trade issues connected to the preferential agreement. This point is in the spirit of Limão (2007) who studies the relevance of non-trade objectives for tariff choices. We therefore examine in this part whether the observed negative effect of PTA shares on NTMs is more pronounced for countries with deeper PTA agreements, i.e., PTAs with provisions on more topics.

To measure PTA depth, we employ two distinct approaches. Our first approach relies on the average count of provisions in countries' PTAs. Specifically, we follow Kuenzel and Sharma (2021) and obtain detailed data on trade agreement provisions from Hofmann et al. (2017) who map, in a binary fashion, 52 provisions for all PTAs notified to the WTO that were signed since 1958. We then add up the number of agreement provisions to obtain a PTA depth measure at the importer-exporter level, implying that the PTA depth of an agreement ranges from 0 to 52. When a pair of countries is covered by more than one agreement, we take the maximum depth count among the available agreements. In the next step, we compute for all sample periods a unique weighted average PTA depth count for each importer, using as weights a PTA partner's share in the importing country's aggregate imports from all PTA partners. In the last step, we then average at the importer level the year-specific PTA depth count measures across all sample periods. In panel A of Table 10, we present the PTA share results when splitting the sample of importers into 'High' and 'Low' levels of

PTA depth based on the median value (18.43 out of 52) observed for the latter in our sample.

Our second approach to measure PTA depth relies on a clustering approach to PTA provisions as implemented by Baier and Regmi (2023) and Fontagné et al. (2023). These papers use clustering algorithms to identify groups of similar PTAs based on their content. Fontagné et al. (2023) classify PTAs into three separate categories based on their level of ambition (with 1 being the least ambitious, and 3 being the most ambitious). We use the latter classification of PTAs to generate an average PTA depth index for each importer. Specifically, we calculate for each importer and 3-year period a weighted PTA depth index based on the sum of PTA ambition across all partners. PTA partners with the most ambitious type of PTA receive a score of 3, partners with an intermediate level of PTA ambition receive a 2, and partners with the least ambitious PTAs receive a 1. In the last step, we then divide this index value by the total number of PTA partners for a given importer to obtain an importer-period specific average PTA depth score. Based on this measure, the median PTA depth score in our sample is 1.36. Panel B in Table 10 shows the PTA share results when splitting the sample of importers into 'High' and 'Low' levels of PTA depth based on this median value.

Consistent with our expectations, the estimates in both panels A and B of Table 10 show that importers with 'High' PTA depth are driving the negative effect of PTAs on NTMs. In all six specifications with 'High' PTA depth, the PTA share coefficients are negative and statistically significant at the one percent level. At the same time, importers with 'Low' PTA depth either see no statistically significant or even positive PTA share impacts on NTMs. Moreover, as indicated by the p-values at the bottom of each panel in Table 10, we can reject the hypothesis that the PTA share coefficients are equal for each of the six result groups at any conventional statistical significance level.[19] Table B13 in Appendix B shows results when basing the PTA depth calculations in Panel A only on legally enforceable provisions in PTAs. The pattern of estimates is very similar in that case as well.

6.2 NTM Subcategories

As discussed in section 4.1, UNCTAD categorizes NTMs into 16 different chapters (see Table 2). In this part, we examine the heterogeneity of the PTA effect on these various NTM subcategories. Specifically, we estimate for each NTM subcategory a separate regression of the level specification in

[19] In Table B12, we also explore to what extend the presence of SPS/TBT provisions affects the impact of PTA exposure on NTMs. These estimates show that countries who have greater depth along these dimensions are driving the negative link between PTAs and NTMs.

equation (1). In all cases, we instrument the actual PTA share in the first stage with the predicted PTA share as outlined in equation (2). Table 11 reports the second-stage estimates for the PTA share variable in each respective NTM subcategory regression. Note that we are only able to estimate regressions for 15 out of the 16 NTM categories as we do not observe any NTMs in UNCTAD's 'post-sales restrictions' category in our sample.

Three noteworthy patterns emerge from Table 11. First, in line with the aggregate NTM regressions results in Table 3, we observe negative and significant PTA share effects for seven of the 15 NTM subcategories. Of the remaining eight subcategories, four show no significant impact of the PTA share and four exhibit significant positive estimates. Hence, there is substantial heterogeneity in the PTA share effect across NTM categories. Second, the NTM subcategories most commonly used, as measured by the mean NTM count per HS6 product, all show a significant negative effect of the PTA share on NTM counts. In the second to last row, Table 11 reports the mean NTM count per HS 6-digit product for each subcategory. The SPS, TBT and 'export-related measures' chapters record negative PTA share effects while exhibiting by far the greatest incidence of NTMs. Their respective average NTM count per product is close to one over the sample period. Note that the average incidence of NTMs per product is also closely associated with the mean share of imports covered by different types of NTMs. These three NTM categories cover the highest average share of imports, ranging from 16 percent for SPS to 28.2 percent for TBT measures.

At the same time, all of the four categories with a positive PTA share impact record an average NTM incidence of close to zero per product, except for the 'price controls' category with an average count of 0.315 per HS 6-line. The overall negative effect of PTA exposure on NTMs in our baseline results is therefore driven by the categories that account for the vast majority of NTMs. Considering our rent preservation theory discussed earlier, one could rationalize this pattern by the incentive for PTA partners to focus their efforts to limit NTMs in subcategories that exhibit the largest counts. Interventions in categories with low numbers of NTMs are not likely to offer substantial benefits for PTA partners.

Lastly, UNCTAD classifies three of the subcategories in Table 11 as technical NTMs: SPS, TBT, and 'pre-shipment inspections.' That is, technical NTMs mainly pertain to some form of product standards. 12 of the 16 remaining subcategories are non-technical measures affecting imports, while one category captures export-related NTMs. The results in Table 11 indicate that the PTA share effect is negative throughout for the technical NTM subcategories while results are more mixed for the remaining non-technical NTM subcategories. In Table B14 in Appendix B, we further investigate this pattern by pooling NTMs into two broader aggregates: i. technical standards (SPS, TBT, pre-shipment inspections) and ii. non-technical border protections (TTB, quantity controls, price controls, finance measures). Panel A provides results when using NTM stock counts and panel B uses instead trade-weighted NTM stocks. Both sets of estimates provide further evidence that the negative effect of PTAs on NTMs is driven by the technical standards categories. In fact, 5 out of the 6 estimates in panels A and B for the non-technical border NTMs are positive and significant albeit with relatively small magnitudes.

This dichotomy in the results points to the possibility that technical NTMs are less politically salient and perhaps easier to limit or cut for governments in response to pressures by PTA partners. Note that limiting technical NTMs does not necessarily imply a threat to non-trade goals, such as consumer safety or environmental protection. For instance, PTAs could induce NTMs to be streamlined through regulatory cooperation and harmonization without actually lowering standards. Moreover, we are observing a substantial increase in NTMs across the board, including in technical NTMs, over the sample period.[20] In practical terms, PTA membership therefore has been more likely to slow the rise in NTMs instead of reversing it.

6.3 Developing versus Advanced Economies

Panel A in Figure 2 shows that, on average, advanced economies impose a substantially higher number of NTMs per HS 6-digit product compared to developing countries. Hence, the underlying reasons for imposing NTMs might substantially differ based on income levels. For example, advanced economies in our sample feature substantially lower average tariff levels (3.7 percent) than developing countries (7.2 percent), which could imply differing incentives to lower or raise NTMs after negotiating PTAs. In addition, advanced economies have, on average, much higher product-level PTA import shares than developing countries (43.7 vs. 29.1 percent). In this part, we therefore examine if the PTA share impact on NTMs differs between these two groups of countries.

Table 12 presents results when splitting the samples in the level and difference specifications into advanced and emerging economies. We classify countries in the 'Advanced' category when they were considered 'High Income' by the World Bank in 2010; see Table B1 in Appendix B for each country's classification. The PTA share estimates in the 'Advanced' economy samples in Table 12

[20] Whereas the incidence of both technical and non-technical NTMs has increased over the sample period, the growth of the former group has been somewhat faster. The average count of technical NTMs per HS6 product rose from .9 in 2001 to 2.8 in 2016 compared to an increase from .9 to 2.3 for non-technical NTMs.

are negative and statistically significant at the one percent level throughout with the magnitude of the effects being very similar across the specifications as well. At the same time, in the 'Developing' samples, the PTA share impact is not significantly different from zero. Hence, the negative impact of PTAs on NTMs is driven by advanced economies. In general, for advanced economies, NTMs account for a higher share of their trade protection levels.[21] Therefore, this group of countries may have greater scope for their NTM policies to be affected in response to pressures from PTA partners.

6.4 Additional Results

We conducted a number of additional robustness checks that we briefly discuss here. First, we considered to what extent the PTA share effect on NTMs differs between products with high and low levels of NTM coverage. Specifically, Table B15 in Appendix B shows results when splitting the sample in two based on the number of NTMs in place. For both products with 'High' and 'Low' levels of NTM stocks we find throughout a negative and highly statistically significant impact of PTAs on NTMs. Hence, the results are not driven by how many NTMs are initially observed for a given product. Second, panel B in Figure 2 shows that agricultural products are subject to substantially more NTMs than other product groups. Table B16 in Appendix B shows that our results are similar if we drop agricultural products. The negative PTA share effect on NTMs cannot be explained by agricultural products alone.

Lastly, our PTA share and predicted PTA share variables both change based on the formation of new PTAs and due to changes in the import shares of existing PTA partners. To test whether the results are driven by new PTAs that emerge over the sample period, Table B17 in Appendix B considers an additional set of PTA share and predicted PTA share measures that fix the initial bilateral product import shares throughout and so only capture variation due to the formation of new PTAs. We see that conditional on the fixed bilateral share measure, the traditional PTA share variable still has consistently negative and statistically significant effects on NTMs. Therefore, our results are not specifically driven by new PTAs.

[21] UNCTAD (2013) estimates that for high-income countries NTMs account for two thirds of total import protection, whereas for middle- and low-income countries the respective shares are closer to 40 percent and 50 percent, respectively.

7 Concluding Remarks

We analyze the product-level impact of PTAs on NTMs for a wide range of countries during the 2000s and 2010s. Using an instrumental variable strategy that leverages PTA partner countries' product-level export patterns to third-countries, we estimate that greater import shares of PTA partners lower a country's NTM stock. Examining several potential mechanisms, we find support for what we call a "rent preservation effect," whereby NTM reductions are driven by PTA partners' incentives to preserve their preferential rents. Consistent with this prediction, the negative effect of PTAs on NTMs are driven by products with higher preferential margins, the difference between MFN and preferential tariff rates.

The negative link between PTA exposure and NTM usage is robust across various level and difference specifications, and also can be observed when focusing on countries' weighted applied tariffs that take into account actual tariff rates on all trading partners and the latter's respective import shares. The NTM-reducing effect of PTAs is not uniform and varies based on several PTA, product and country characteristics. Specifically, we find that the negative PTA-NTM nexus is amplified for (i) deeper PTAs, (ii) technical NTMs, and (iii) advanced economies. At the same time, there is no evidence that the effects are confined to NTMs that target broader or narrower sets of countries, agricultural products, or products that are subject to more NTMs.

Importantly, the results in our paper highlight that PTAs can affect trade policies on non-partner countries much more broadly than just through MFN tariffs. Our findings show that PTAs serve as a building block toward freer multilateral trade by reducing NTMs countries impose on both PTA partners and non-partners. In view of the substantial increase in NTM usage across countries in recent years, the results in this paper indicate that PTAs might be one means to slow or reverse this trend. Given the increasing richness and depth of available PTA and NTM data, we believe that further exploring the interplay between PTA provisions, tariffs and NTMs is a very promising area for future research.

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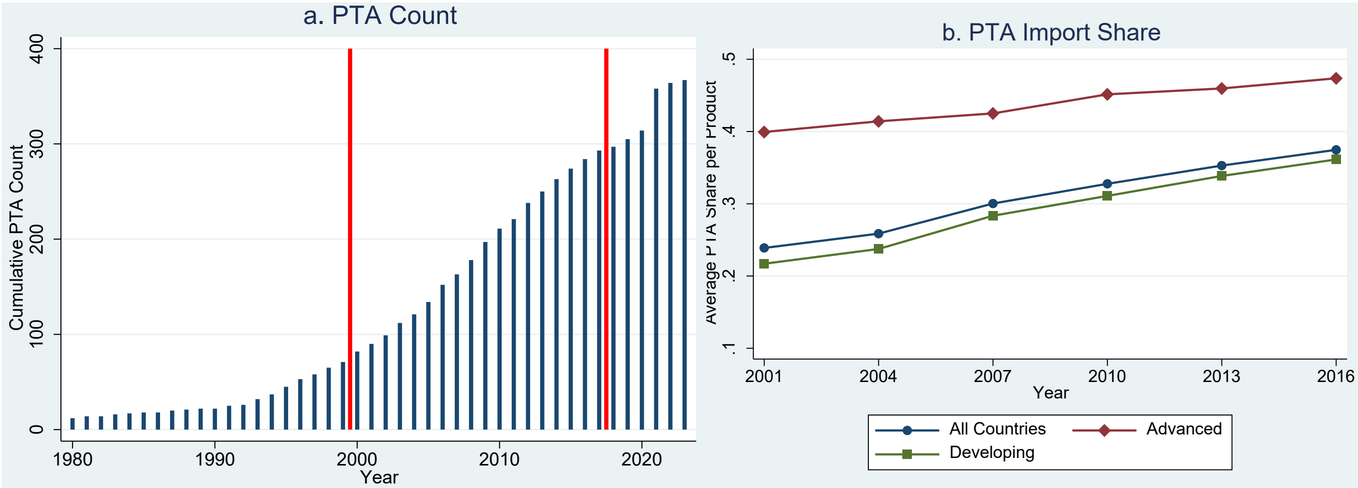
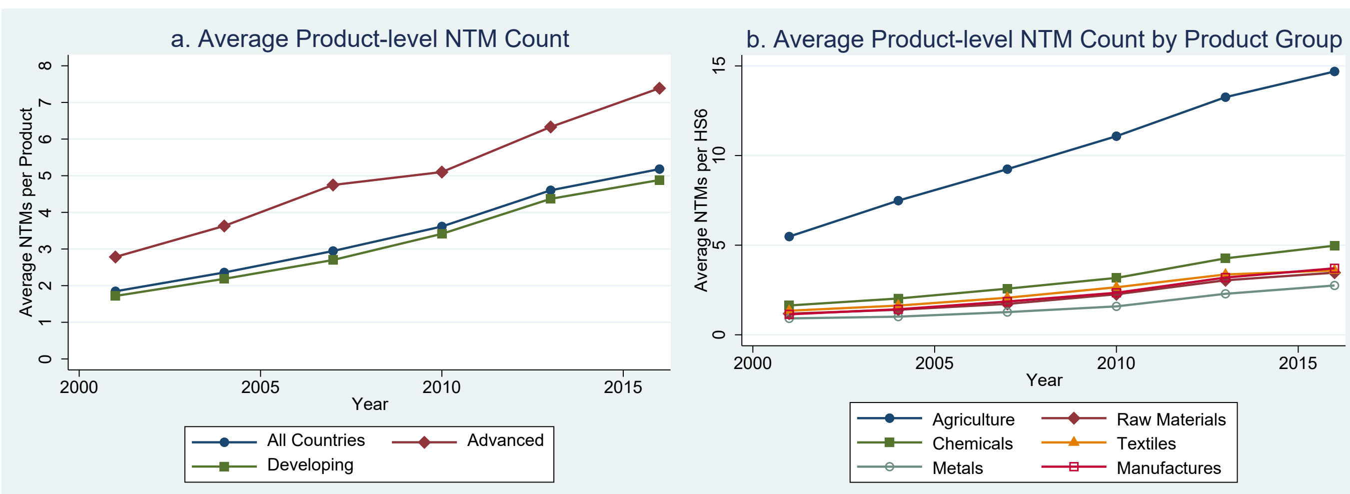
Figure 1: Cumulative Number of PTAs in Force and PTA Import Share



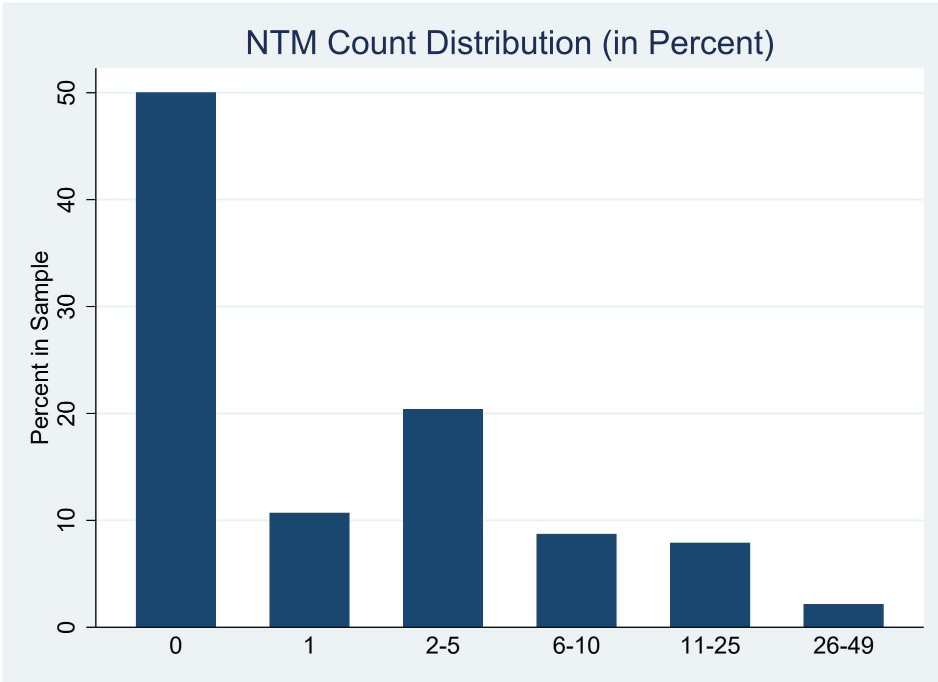
Notes: Authors' calculations based on information from World Trade Organization (2024), CEPII (2023), and Egger and Larch (2008). Panel a. shows the number of cumulative PTAs in force that have been notified to the WTO. The red vertical lines delimit our sample period. Panel b. shows the average import share accounted for by PTA partners over our sample period.

Figure 2: Average Product-level NTM Count



Notes: Authors' calculations based on information from UNCTAD (2024b). Panel a. shows the average product-level number of NTMs overall and by country income level. Panel b. shows the average product-level number of NTMs by product group.

Figure 3: NTM Count Distribution



Notes: Authors' calculations based on information from UNCTAD (2024b). The figure shows the distribution of NTM counts for the 'Level' sample.

Table 1: Summary Statistics

Variable	Definition	Obs	Mean	SD	Min	Max
NTM_{ist}	Non-tariff measure count	2,342,442	3.419	6.591	0.000	49.000
PS_{ist-1}	PTA partners' share of exports to the rest of the world	2,342,442	0.074	0.147	0.000	1.000
PTAshare_{ist-1}	Share of imports originating from PTA partners	2,342,442	0.309	0.350	0.000	1.000
WT_{ist-1}	Trade-weighted average applied tariff rate	2,342,442	0.067	0.163	0.000	10.000
ΔNTM_{ist}	Change in non-tariff measure count between consecutive periods	1,949,479	0.766	2.463	-99.000	49.000
ΔPS_{ist-1}	Change in PS between consecutive periods	1,949,479	0.017	0.071	-0.936	0.999
$\Delta\text{PTAshare}_{ist-1}$	Change in PTAshare between consecutive periods	1,949,479	0.027	0.254	-1.000	1.000
ΔWT_{ist-1}	Change in WT between consecutive periods	1,949,479	-0.006	0.119	-10.000	10.000
$\Delta_{15}\text{NTM}_{ist}$	Change in non-tariff measure count between 2001 and 2016	386,790	3.554	6.254	-46.000	49.000
$\Delta_{15}\text{PS}_{ist-1}$	Change in PS between 2001 and 2016	386,790	0.084	0.174	-0.913	0.999
$\Delta_{15}\text{PTAshare}_{ist-1}$	Change in PTAshare between 2001 and 2016	386,790	0.135	0.389	-1.000	1.000
$\Delta_{15}\text{WT}_{ist-1}$	Change in WT between 2001 and 2016	386,790	-0.030	0.227	-10.000	9.988

Notes: All variables are at the importer-period-HS6 level.

Table 2: Average NTM Count per HS6 and Share of Total NTM Stock by Subcategory, 2001 and 2016

NTM Subcategory	Avg. HS6 NTM Count		Share of Total NTM Stock	
	2001	2016	2001	2016
Sanitary and Phytosanitary Measures (SPS)	0.486	1.308	0.263	0.253
Technical Barriers to Trade (TBT)	0.390	1.341	0.211	0.259
Pre-shipment Inspections	0.051	0.190	0.027	0.037
Temporary Trade Barriers (TTB)	0.034	0.037	0.018	0.007
Quantity Controls	0.191	0.458	0.104	0.088
Price Controls	0.198	0.512	0.107	0.099
Finance Measures	0.017	0.114	0.009	0.022
Competition Measures	0.015	0.048	0.008	0.009
Investment Measures	0.000	0.008	0.000	0.002
Distribution Restrictions	0.000	0.001	0.000	0.000
Post-sales Restrictions	0.000	0.000	0.000	0.000
Subsidies	0.000	0.000	0.000	0.000
Procurement Restrictions	0.001	0.001	0.001	0.000
Intellectual Property (IP) Restrictions	0.035	0.034	0.019	0.007
Rules of Origin (ROO)	0.024	0.023	0.013	0.004
Export-related Measures	0.404	1.106	0.219	0.213
Total	**1.847**	**5.181**	**1.000**	**1.000**

Table 3: NTMs and PTA Shares – Baseline IV Results

Dep. Variable:	Level NTM_{ist} (1)	SD ΔNTM_{ist} (2)	LD $\Delta_{15} NTM_{ist}$ (3)
PTAshare$_{ist-1}$	-0.265***		
	(0.054)		
ΔPTAshare$_{ist-1}$		-0.292***	
		(0.035)	
Δ_{15}PTAshare$_{ist-1}$			-0.404***
			(0.089)
Observations	2,342,442	1,949,479	386,790
First-stage F-stat	53,911	37,874	28,446
Importer x year FE	Yes	Yes	Yes
6-digit HS x importer FE	Yes	No	No
6-digit HS x year FE	Yes	Yes	Yes

Notes: Clustered standard errors at the importer/6-digit HS level are in parentheses. ***, ** and * indicate 1 percent, 5 percent and 10 percent significance levels, respectively. All regressors are 3-year averages and the dependent variable is the next period's NTM stock.

Table 4: NTMs and Weighted Applied Tariffs – Baseline IV Results

Dep. Variable:	Level NTM_{ist} (1)	SD ΔNTM_{ist} (2)	LD $\Delta_{15} NTM_{ist}$ (3)
WT$_{ist-1}$	13.318***		
	(2.926)		
ΔWT$_{ist-1}$		43.331***	
		(10.511)	
Δ_{15}WT$_{ist-1}$			9.481***
			(2.221)
Observations	2,342,442	1,949,479	386,790
First-stage F-stat	128.6	22.71	131.6
Importer x year FE	Yes	Yes	Yes
6-digit HS x importer FE	Yes	No	No
6-digit HS x year FE	Yes	Yes	Yes

Notes: Clustered standard errors at the importer/6-digit HS level are in parentheses. ***, ** and * indicate 1 percent, 5 percent and 10 percent significance levels, respectively. All regressors are 3-year averages and the dependent variable is the next period's NTM stock.

Table 5: Sector-specific NTM AVEs, Trade Elasticities and Trade Effects

GTAP Sectors	AVE per NTM (Weighted Average, in %)	Trade Elasticity (Weighted Average)	Trade Increase from 1 SD Reduction in PTA Share (in %)
Agriculture	3.099	-3.347	0.965
Energy & Mining	0.027	-6.697	0.017
Food, Beverages & Tobacco	3.129	-4.114	1.197
Textiles & Apparel	7.764	-5.245	3.787
Wood & Paper Products	5.055	-8.454	3.974
Chemical & Mineral Products	18.588	-4.828	8.345
Basic Metals	12.008	-10.293	11.494
Fabricated Metal Products	6.430	-4.250	2.542
Machinery & Equipment	4.797	-5.580	2.489
Utilities, Transport & Services	0.002	-9.477	0.002

Notes: The first two columns in the table show sector-specific NTM AVEs calculated from Kravchenko et al. (2022) and trade elasticity estimates from Fontagné et al. (2022), which we obtained by averaging more detailed underlying industry data using trade-based weights. The third column shows the trade impact estimates due to a reduction in the NTM count based on specification (1) in Table 3 by multiplying the product of the first two columns by -0.093, the estimated NTM reduction from a one standard deviation increase in the PTA import share.

Table 6: NTMs and PTA Shares – Broad versus Narrow NTMs

Dep. Variable:	NTM_{ist}	ΔNTM_{ist}	$\Delta_{15}NTM_{ist}$	NTM_{ist}	ΔNTM_{ist}	$\Delta_{15}NTM_{ist}$
	(1)	(2)	(3)	(4)	(5)	(6)
NTM target:	World			Specific Countries		
PTAshare$_{ist-1}$	-0.140***			-0.125***		
	(0.047)			(0.022)		
ΔPTAshare$_{ist-1}$		-0.226***			-0.066***	
		(0.031)			(0.014)	
Δ_{15}PTAshare$_{ist-1}$			-0.104			-0.300***
			(0.079)			(0.035)
Observations	2,342,442	1,949,479	386,790	2,342,442	1,949,479	386,790
First-stage F-stat	53,911	37,874	28,446	53,911	37,874	28,446
Importer x year FE	Yes	Yes	Yes	Yes	Yes	Yes
6-digit HS x importer FE	Yes	Yes	No	No	No	No
6-digit HS x year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Clustered standard errors at the importer/6-digit HS level are in parentheses. ***, ** and * indicate 1 percent, 5 percent and 10 percent significance levels, respectively. All regressors are 3-year averages and the dependent variable is the next period's NTM stock.

Table 7: NTMs and PTA Shares – High versus Low Preferential Margins

	Level		SD		LD	
Dep. Variable:	NTM_{ist}		ΔNTM_{ist}		$\Delta_{15}NTM_{ist}$	
	(1)	(2)	(3)	(4)	(5)	(6)
Preferential margin by country:	High	Low	High	Low	High	Low
PTAshare$_{ist-1}$	-0.973***	0.150***				
	(0.119)	(0.058)				
ΔPTAshare$_{ist-1}$			-0.862***	-0.022		
			(0.079)	(0.037)		
Δ_{15}PTAshare$_{ist-1}$					-1.419***	0.329***
					(0.179)	(0.101)
Observations	788,238	1,515,843	682,417	1,266,881	144,530	242,208
First-stage F-stat	13,621	35,076	11,347	26,313	9,603	17,616
Coef. equality test p-val	0.000		0.000		0.000	
Importer x year FE	Yes	Yes	Yes	Yes	Yes	Yes
6-digit HS x importer FE	Yes	Yes	No	No	No	No
6-digit HS x year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Clustered standard errors at the importer/6-digit HS level are in parentheses. ***, ** and * indicate 1 percent, 5 percent and 10 percent significance levels, respectively. The average preferential margin cutoff between samples is .063 (in ad valorem terms). All regressors are 3-year averages and the dependent variable is the next period's NTM stock.

Table 8: NTMs and PTA Shares – High versus Low Export Shares

	Level		SD		LD	
Dep. Variable:	NTM_{ist}		ΔNTM_{ist}		$\Delta_{15} NTM_{ist}$	
	(1)	(2)	(3)	(4)	(5)	(6)
Export share:	High	Low	High	Low	High	Low
PTAshare$_{ist-1}$	-0.217***	-0.093				
	(0.074)	(0.076)				
ΔPTAshare$_{ist-1}$			-0.345***	-0.163***		
			(0.051)	(0.047)		
Δ_{15}PTAshare$_{ist-1}$					-0.238**	-0.287**
					(0.121)	(0.131)
Observations	1,120,725	1,144,127	971,574	977,740	188,491	198,248
First-stage F-stat	35,463	21,301	28,258	15,965	18,376	11,740
Coef. equality test p-val	0.239		0.009		0.784	
Importer x year FE	Yes	Yes	Yes	Yes	Yes	Yes
6-digit HS x importer FE	Yes	Yes	No	No	No	No
6-digit HS x year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Clustered standard errors at the importer/6-digit HS level are in parentheses. ***, ** and * indicate 1 percent, 5 percent and 10 percent significance levels, respectively. The cutoff between samples is an export share of .0001%. All regressors are 3-year averages and the dependent variable is the next period's NTM stock.

Table 9: NTMs and PTA Shares – PTA vs. Non-PTA Partner NTMs

Dep. Variable:	NTM_{ist}	ΔNTM_{ist}	$\Delta_{15} NTM_{ist}$	NTM_{ist}	ΔNTM_{ist}	$\Delta_{15} NTM_{ist}$
	(1)	(2)	(3)	(4)	(5)	(6)
NTM target:	PTA Partners			Non-PTA Partners		
PTAshare$_{ist-1}$	-0.271***			-0.174***		
	(0.051)			(0.051)		
ΔPTAshare$_{ist-1}$		-0.306***			-0.246***	
		(0.034)			(0.034)	
Δ_{15}PTAshare$_{ist-1}$			-0.358***			-0.266***
			(0.085)			(0.085)
Observations	2,342,442	1,949,479	386,790	2,342,442	1,949,479	386,790
First-stage F-stat	53,911	37,874	28,446	53,911	37,874	28,446
Importer x year FE	Yes	Yes	Yes	Yes	Yes	Yes
6-digit HS x importer FE	Yes	Yes	No	No	No	No
6-digit HS x year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Clustered standard errors at the importer/6-digit HS level are in parentheses. ***, ** and * indicate 1 percent, 5 percent and 10 percent significance levels, respectively. All regressors are 3-year averages and the dependent variable is the next period's NTM stock.

Table 10: NTMs and PTA Shares – PTA Depth

Panel A	PTA Depth Based on Provision Counts					
	Level		SD		LD	
Dep. Variable:	NTM_{ist}		ΔNTM_{ist}		$\Delta_{15} NTM_{ist}$	
	(1)	(2)	(3)	(4)	(5)	(6)
PTA Depth:	High	Low	High	Low	High	Low
PTAshare$_{ist-1}$	-0.555***	-0.124				
	(0.076)	(0.088)				
ΔPTAshare$_{ist-1}$			-0.506***	-0.003		
			(0.049)	(0.048)		
Δ_{15}PTAshare$_{ist-1}$					-0.843***	0.450***
					(0.128)	(0.122)
Observations	1,034,779	1,203,319	921,048	1,014,209	197,521	189,269
First-stage F-stat	23,022	23,524	19,833	18,213	13,615	16,086
Coef. equality test p-val	0.000		0.000		0.000	
Importer x year FE	Yes	Yes	Yes	Yes	Yes	Yes
6-digit HS x importer FE	Yes	Yes	No	No	No	No
6-digit HS x year FE	Yes	Yes	Yes	Yes	Yes	Yes

Panel B	PTA Depth Based on Provision Clustering					
	Level		SD		LD	
Dep. Variable:	NTM_{ist}		ΔNTM_{ist}		$\Delta_{15} NTM_{ist}$	
	(7)	(8)	(9)	(10)	(11)	(12)
PTA Depth:	High	Low	High	Low	High	Low
PTAshare$_{ist-1}$	-0.448***	0.420***				
	(0.065)	(0.088)				
ΔPTAshare$_{ist-1}$			-0.559***	0.106**		
			(0.047)	(0.053)		
Δ_{15}PTAshare$_{ist-1}$					-0.694***	0.088
					(0.122)	(0.140)
Observations	1,025,179	1,011,573	886,914	836,129	196,487	139,853
First-stage F-stat	21,405	24,276	20,859	16,600	15,467	12,141
Coef. equality test p-val	0.000		0.000		0.000	
Importer x year FE	Yes	Yes	Yes	Yes	Yes	Yes
6-digit HS x importer FE	Yes	Yes	No	No	No	No
6-digit HS x year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Clustered standard errors at the importer/6-digit HS level are in parentheses. ***, ** and * indicate 1 percent, 5 percent and 10 percent significance levels, respectively. In panel A, the cutoff between samples is 18.43 PTA provisions (out of 52) across a country's agreements. In panel B, the cutoff between samples is a weighted depth score of 1.36 across a country's agreements based on the PTA ambition clustering in Fontagné et al. (2023). All regressors are 3-year averages and the dependent variable is the next period's NTM stock.

Table 11: NTMs and PTA Shares – Results by NTM Subcategories

	NTM Subcategory Counts							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. variable:	SPS	TBT	Preshipment Inspections	TTB	Quantity Controls	Price Controls	Finance Measures	Competition Measures
PTAshare_{ist-1}	-0.120***	-0.085***	-0.046***	0.023***	-0.023***	0.031***	0.001	-0.007***
	(0.034)	(0.020)	(0.005)	(0.008)	(0.006)	(0.004)	(0.000)	(0.001)
Mean NTM Count per HS6	0.908	0.853	0.128	0.036	0.321	0.315	0.049	0.027
Mean HS6 import share with NTM	0.160	0.282	0.088	0.008	0.163	0.157	0.035	0.013
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	
Dep. variable:	Investment Measures	Distribution Restrictions	Subsidies	Procurement Restrictions	IP Restrictions	Rules of Origin	Export-related Measures	
PTAshare_{ist-1}	0.003***	-0.000***	-0.000	-0.000	0.001***	0.000	-0.043***	
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.015)	
Mean NTM Count per HS6	0.006	0.001	0.000	0.001	0.035	0.024	0.716	
Mean HS6 import share with NTM	0.003	0.000	0.000	0.001	0.012	0.004	0.226	

Notes: The table presents second-stage PTAshare_{ist-1} coefficients from instrumental variable regressions of the model in equation (1) using NTM subcategory counts as dependent variables. All regressions include importer-year, importer-product and product-year fixed effects. The number of observations and first-stage F-stats in all specifications are identical to column (1) in Table 3. Clustered standard errors at the importer/6-digit HS level are in parentheses. ***, ** and * indicate 1 percent, 5 percent and 10 percent significance levels, respectively. All regressors are 3-year averages and the dependent variable is the next period's NTM stock.

Table 12: NTMs and PTA Shares – Effects by Income

	Level		SD		LD	
Dep. Variable:	NTM_{ist}		ΔNTM_{ist}		$\Delta_{15} NTM_{ist}$	
	(1)	(2)	(3)	(4)	(5)	(6)
Income group:	Advanced	Developing	Advanced	Developing	Advanced	Developing
PTAshare_{ist-1}	-1.080***	-0.045				
	(0.132)	(0.058)				
$\Delta\text{PTAshare}_{ist-1}$			-1.149***	-0.020		
			(0.102)	(0.031)		
$\Delta_{15}\text{PTAshare}_{ist-1}$					-1.472***	0.007
					(0.239)	(0.093)
Observations	389,717	1,952,725	323,871	1,625,608	63,676	323,114
First-stage F-stat	16,559	37,318	12,741	26,117	7,956	19,205
Coef. equality test p-val	0.000		0.000		0.000	
Importer x year FE	Yes	Yes	Yes	Yes	Yes	Yes
6-digit HS x importer FE	Yes	Yes	No	No	No	No
6-digit HS x year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Clustered standard errors at the importer/6-digit HS level are in parentheses. ***, ** and * indicate 1 percent, 5 percent and 10 percent significance levels, respectively. We classify countries in the 'Advanced' category when they were considered 'High Income' by the World Bank in 2010. All regressors are 3-year averages and the dependent variable is the next period's NTM stock.

Appendix A: Rent Preservation Theory

In this part, we illustrate the incentives underlying the rent preservation channel discussed in section 2.2.3. Note that the framework below is mainly intended to help interpret the empirical results, and it abstracts away from potentially important theoretical elements such as the optimal choice of non-tariff measures or tariffs as well as general equilibrium effects. We consider a setting with one importer (country A) and two exporters (countries B and C). Country B is a PTA partner and C is a non-PTA partner. We assume linear import demand and export supply curves for ease of illustration.

Import demand is $m = b_A(a_A - p)$, where m is the import quantity, p is the consumer price, a_A is the autarky price in A and b_A is a slope parameter. Export supply for country i is $x_i = b_i(p - t_i - n - a_i)$, where x_i is export quantity, t_i is the (specific) tariff imposed on i, n is an NTM in the importing country, a_i is the Autarky price in i, and b_i is a slope parameter. We assume that the PTA eliminates the tariff on i (i.e., $t_B = 0$) but —consistent with the general pattern in the data— the NTM is applied across the board and therefore does not have an i subscript, though we briefly discuss the case where NTMs are targeted at the end of this appendix. The equilibrium price is determined by equating demand and supply:

$$b_A(a_A - p) = \sum_{i \in B,C} b_i(p - t_i - n - a_i)$$

For later reference, we can collect several comparative statics with respect to the price using the implicit function theorem on the equilibrium condition:

$$\frac{dp}{dn} = \frac{\sum_i b_i}{b_A + \sum_i b_i} < 1$$

$$\frac{dp}{da_B} = \frac{b_B}{b_A + \sum_i b_i} < 1$$

The exporter surplus for the PTA partner country B is:

$$\Pi_B = 0.5 b_B (p - n - a_B)^2$$

We then ask the question: How much would producers in $i = B$ be willing to pay to prevent an NTM increase of dn? We denote the amount they would be willing to pay, which will be equal to the loss in producer surplus, as W_i:

$$W_i = -d\Pi_B = b_B(p - n - a_B)(dn - dp)$$

Next we are interested in whether NTMs are more or less likely when a product's "exposure" to a PTA is greater by examining the effect of a lower a_B, which captures the strength of the country's comparative advantage (using also the equilibrium comparative statics derived earlier):

$$-\frac{dW_i}{da_B} = b_B(1 - dp/da_B)(dn - dp) > 0$$

Hence, an exogenous increase in the PTA share —driven by a reduction in country B's costs in this case— will amplify the incentives to prevent an NTM increase. The intuition is straightforward: If the country is a larger exporter of the product, it has more to lose and therefore will be willing to pay more to prevent NTMs.

We can also consider how a higher MFN tariff rate affects incentives to prevent an NTM increase:

$$\frac{dW_i}{dt_C} = b_B(dp/dt_C)(dn - dp) > 0$$

A higher MFN tariff therefore increases incentives for the PTA partner to prevent an NTM increase. This result reflects the fact that country B's exporter rents are higher when the market is more protected from non-PTA partner exporting firms.

Note that the analysis so far only considers the PTA partner's interests. How would the potential lobbying pressures from domestic import-competing producers in country A affect these predictions? First, note that the model as described allows for the presence of domestic import-competing firms but does not require it. In many cases —especially at the detailed product level— it is likely that there are no or very few import-competing firms. Second, if there are import-competing firms, their interests would actually further amplify the effects identified here in this framework. A lower value of a_B will imply lower domestic producer surplus and so reduce the amount that domestic producers would be willing to pay in order to secure an NTM increase.

To make this point formally, we assume that domestic supply is given by $s = \sigma(p - c)$, where σ and c are constants. We further presume domestic supply is not so large that there are no imports. Domestic producer surplus is then $\pi_A = 0.5\sigma(p - c)^2$. The amount domestic firms would in turn be willing to pay to secure an NTM increase of dn is:

$$W_A = \sigma(p - c)(dp/dn)$$

How is the amount that domestic firms firms are willing to pay for an NTM affected by an exogenous increase in the PTA share, which is captured again by a reduction in a_B?

$$-\frac{dW_A}{da_B} = -\sigma(dp/da_B)(dp/dn) < 0$$

Hence, domestic firms have a weaker incentive to impose an NTM under this scenario. This effect is similar to the juggernaut effect identified in the PTA/MFN literature and discussed in section 2.2.1.

A potential complicating factor here would be country C's incentives to prevent an NTM. These interests could indeed counteract the effect for country B, at least to some degree, since a lower a_B would reduce country C's producer surplus and its incentive to oppose an NTM. From an institutional perspective, it seems reasonable to think that country B would be much more invested in preventing NTMs in markets where it has preferential rents relative to the potential counteracting effects of many non-PTA exporters.

More formally, we can consider the effect on the joint incentives of countries B and C. Assuming that the slope parameters are the same for the three countries, i.e., $b_A = b_B = b_C = b$, which would be true if the three countries have the same domestic demand and domestic supply curve slopes, respectively, the joint amount that countries B and C would be willing to pay to prevent an NTM is:

$$W_B + W_C = b_B(p - n - a_B)(dn - dp) + b_C(p - n - t_C - a_C)(dn - dp)$$

An increase in a product's "exposure" to the PTA, then affects this willingness to pay as follows:

$$\begin{aligned} -\frac{d(W_A + W_B)}{da_B} &= b_B(1 - dp/da_B)(dn - dp) - b_C(dp/da_B)(dn - dp) \\ &= b(1 - 2(dp/da_B))(dn - dp) > 0 \quad . \end{aligned}$$

Note that under these assumptions, $1 - 2(dp/da_B) = 1 - 2/3 > 0$. Hence, a decrease in a_B still increases the combined willingness of B and C to prevent an NTM increase. The intuition is straightforward: the direct benefit to B from a decrease in cost is greater than the indirect effects on B and C through the price effects brought about by the cost decrease.

In the above analysis, we assume that the NTM is applied across the board rather than potentially being targeted at a subset of countries. In theory, what would happen if the NTM could be applied in a targeted fashion? In this case, there is an additional mechanism that emerges. The importing country could have an incentive to impose a *higher* NTM on the PTA partner country in order to prevent the loss of tariff revenue due to the standard trade diversion that is created by the PTA. However, this outcome is not in line with our data as most NTMs are applied across the board. In fact, we observe that NTMs are somewhat *less* frequently applied on PTA relative to non-PTA partners. Hence, PTA partners are unlikely to accept a situation where they differentially face higher NTMs.

Appendix B: Additional Results

Table B1: Average NTMs per Product by Country

Country	Obs.	NTM/HS6	Country	Obs.	NTM/HS6	Country	Obs.	NTM/HS6
Algeria	28,412	11.5	Hong Kong*	28,419	1.8	Panama	28,247	1.4
Argentina	28,432	6.4	India	28,467	0.4	P. N. Guinea	28,385	2.4
Armenia	28,067	2.5	Indonesia	27,611	4.9	Paraguay	28,458	1.7
Azerbaijan	28,465	0.6	Israel*	28,468	2.4	Peru	28,339	1.3
Bangladesh	28,422	3.9	Jamaica	28,442	1.7	Philippines	27,010	13.7
Benin	28,314	3.0	Japan*	28,442	1.6	Russian	28,262	2.7
Bolivia	28,440	2.9	Jordan	28,469	0.3	Rwanda	28,436	2.5
Brazil	28,318	5.3	Kazakhstan	28,443	2.3	Saudi Arabia*	26,618	12.3
Burkina Faso	28,470	0.5	Kenya	28,466	3.1	Senegal	28,470	1.1
Cambodia	28,234	5.9	Korea, Rep.*	28,347	1.4	Singapore*	28,391	4.0
Cameroon	28,463	0.7	Kuwait*	26,993	6.4	South Africa	28,248	3.0
Canada*	28,469	0.3	Kyrgyz Rep.	28,448	2.4	Sri Lanka	28,453	3.3
Chad	28,455	0.9	Lao PDR	28,286	3.3	Switzerland*	28,420	5.0
Chile	28,445	2.4	Lebanon	28,470	0.8	Tajikistan	28,463	1.8
China	25,951	11.7	Malawi	28,452	1.4	Tanzania	28,156	4.5
Colombia	28,423	2.7	Malaysia	28,419	3.1	Thailand	27,713	6.0
Costa Rica	28,458	1.5	Mauritius	28,272	3.5	Togo	28,456	3.7
Cote d'Ivoire	28,470	0.2	Mexico	28,455	2.5	Trin. & Tob.	28,463	0.2
Ecuador	28,404	2.6	Morocco	28,443	3.5	Tunisia	28,398	3.9
Egypt	28,448	3.0	Mozambique	28,454	2.0	Turkey	28,410	3.9
El Salvador	28,435	1.1	Myanmar	28,394	4.9	Uganda	28,413	1.7
Ethiopia	28,424	2.9	Nepal	28,470	0.5	UAE*	26,056	7.1
EU*	28,226	6.1	New Zealand*	26,828	25.2	USA*	27,707	5.6
Gabon	28,462	0.5	Nicaragua	28,440	1.1	Uruguay	28,465	1.0
Georgia	28,439	1.7	Niger	28,464	0.9	Venezuela	28,430	1.3
Ghana	28,361	2.6	Norway*	28,333	11.7	Vietnam	27,898	5.3
Guatemala	28,408	2.0	Oman	26,780	5.1	Zimbabwe	28,468	0.9
Honduras	28,454	0.9	Pakistan	28,465	2.2			

Notes: * indicates advanced economy.

Table B2: NTMs, PTA Shares and Applied Tariffs – First-stage Results

Dep. Variable:	Level $PTAshare_{ist-1}$ (B1)	SD $\Delta PTAshare_{ist-1}$ (B2)	LD $\Delta_{15} PTAshare_{ist-1}$ (B3)	Level WT_{ist-1} (B4)	SD ΔWT_{ist-1} (B5)	LD $\Delta_{15} WT_{ist-1}$ (B6)
PS_{ist-1}	0.782***			-0.016***		
	(0.003)			(0.001)		
ΔPS_{ist-1}		0.836***			-0.006***	
		(0.004)			(0.001)	
$\Delta_{15} PS_{ist-1}$			0.735***			-0.031***
			(0.004)			(0.003)
Observations	2,342,442	1,949,479	386,790	2,342,442	1,949,479	386,790
R2	0.765	0.163	0.425	0.681	0.061	0.091
Importer x year FE	Yes	Yes	Yes	Yes	Yes	Yes
6-digit HS x importer FE	Yes	No	No	Yes	No	No
6-digit HS x year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Clustered standard errors at the importer/6-digit HS level are in parentheses. ***, ** and * indicate 1 percent, 5 percent and 10 percent significance levels, respectively. All variables are 3-year averages.

Table B3: NTMs, PTA Shares and Applied Tariffs – OLS Results

Dep. Variable:	Level NTM_{ist} (B1)	SD ΔNTM_{ist} (B2)	LD $\Delta_{15} NTM_{ist}$ (B3)	Level NTM_{ist} (B4)	SD ΔNTM_{ist} (B5)	LD $\Delta_{15} NTM_{ist}$ (B6)
PTAshare_{ist-1}	0.032***					
	(0.011)					
$\Delta\text{PTAshare}_{ist-1}$		-0.000				
		(0.006)				
$\Delta_{15}\text{PTAshare}_{ist-1}$			0.125***			
			(0.024)			
$\text{WeightedTariff}_{ist-1}$				-0.286***		
				(0.020)		
$\Delta\text{WeightedTariff}_{ist-1}$					-0.306***	
					(0.018)	
$\Delta_{15}\text{WeightedTariff}_{ist-1}$						-0.280***
						(0.026)
Observations	2,342,442	1,949,479	386,790	2,342,442	1,949,479	386,790
R2	0.912	0.347	0.563	0.912	0.347	0.563
Importer x year FE	Yes	Yes	Yes	Yes	Yes	Yes
6-digit HS x importer FE	Yes	No	No	Yes	No	No
6-digit HS x year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Clustered standard errors at the importer/6-digit HS level are in parentheses. ***, ** and * indicate 1 percent, 5 percent and 10 percent significance levels, respectively. All regressors are 3-year averages and the dependent variable is the next period's NTM stock.

Table B4: NTMs and PTA Shares – Baseline IV Results without Sample Restrictions

Dep. Variable:	Level NTM_{ist} (B1) + Outliers	(B2) + Small	(B3) + No New PTAs	(B4) All
PTAshare_{ist-1}	-0.254**	-0.158***	-0.260***	-0.211**
	(0.106)	(0.056)	(0.053)	(0.103)
Observations	2,362,506	2,651,035	2,367,681	2,703,280
First-stage F-stat	54,777	56,546	53,856	57,525
Importer x year FE	Yes	Yes	Yes	Yes
6-digit HS x importer FE	Yes	Yes	Yes	Yes
6-digit HS x year FE	Yes	Yes	Yes	Yes

Notes: Clustered standard errors at the importer/6-digit HS level are in parentheses. ***, ** and * indicate 1 percent, 5 percent and 10 percent significance levels, respectively. All regressors are 3-year averages and the dependent variable is the next period's NTM stock.

Table B5: NTMs and PTA Shares – Placebo IV Results

Dep. Variable:	SD ΔNTM_{ist-2} (B1)	SD ΔNTM_{ist} (B2)
ΔPTAshare$_{ist-1}$	0.052**	
	(0.024)	
ΔPTAshare$_{ist+1}$		0.057
		(0.039)
Observations	1,949,479	1,174,005
First-stage F-stat	37,874	25,739
Importer x year FE	Yes	Yes
6-digit HS x importer FE	No	No
6-digit HS x year FE	Yes	Yes

Notes: Clustered standard errors at the importer/6-digit HS level are in parentheses. ***, ** and * indicate 1 percent, 5 percent and 10 percent significance levels, respectively. All regressors are 3-year averages. In column (B1), the dependent variable is the 1-period change in the NTM stock from two periods ago. In column (B2), the dependent variable is the 1-period change for the next period's NTM stock.

Table B6: NTMs and PTA Shares – Excluding Large Importers

Exclusion Criterion:	World Import share $\geq$ 20%			World Import share $\geq$ 10%			World Import share $\geq$ 5%		
	Level			SD			LD		
Dep. Variable:	NTM_{ist} (B1)	ΔNTM_{ist} (B2)	$\Delta_{15} NTM_{ist}$ (B3)	NTM_{ist} (B4)	ΔNTM_{ist} (B5)	$\Delta_{15} NTM_{ist}$ (B6)	NTM_{ist} (B7)	ΔNTM_{ist} (B8)	$\Delta_{15} NTM_{ist}$ (B9)
PTAshare$_{ist-1}$	-0.332***			-0.358***			-0.401***		
	(0.061)			(0.061)			(0.062)		
ΔPTAshare$_{ist-1}$		-0.339***			-0.358***			-0.376***	
		(0.039)			(0.039)			(0.039)	
Δ_{15}PTAshare$_{ist-1}$			-0.480***			-0.501***			-0.565***
			(0.097)			(0.098)			(0.099)
Observations	2,158,142	1,808,068	359,759	2,120,513	1,777,431	353,714	2,062,582	1,730,120	344,429
First-stage F-stat	46,906	36,971	24,782	45,468	36,001	24,092	42,688	34,034	22,661
Importer x year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6-digit HS x importer FE	Yes	No	No	Yes	No	No	Yes	No	No
6-digit HS x year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Clustered standard errors at the importer/6-digit HS level are in parentheses. ***, ** and * indicate 1 percent, 5 percent and 10 percent significance levels, respectively. All regressors are 3-year averages and the dependent variable is the next period's NTM stock.

Table B7: NTMs and PTA Shares – Excluding Largest PTA Exporter

Dep. Variable:	Level NTM_{ist} (B1)	SD ΔNTM_{ist} (B2)	LD $\Delta_{15}NTM_{ist}$ (B3)
PTAshare$_{ist-1}$	-0.248***		
	(0.055)		
ΔPTAshare$_{ist-1}$		-0.293***	
		(0.036)	
Δ_{15}PTAshare$_{ist-1}$			-0.366***
			(0.091)
Observations	2,342,442	1,949,479	386,790
First-stage F-stat	51253	36196	26823
Importer x year FE	Yes	Yes	Yes
6-digit HS x importer FE	Yes	No	No
6-digit HS x year FE	Yes	Yes	Yes

Notes: Clustered standard errors at the importer/6-digit HS level are in parentheses. ***, ** and * indicate 1 percent, 5 percent and 10 percent significance levels, respectively. All regressors are 3-year averages and the dependent variable is the next period's NTM stock.

Table B8: Trade-weighted NTMs and PTA Shares – IV Results

Dep. Variable: Trade-weighted NTM Stock	Level NTM_{ist} (B1)	SD ΔNTM_{ist} (B2)	LD $\Delta_{15}NTM_{ist}$ (B3)
PTAshare$_{ist-1}$	-0.191***		
	(0.048)		
ΔPTAshare$_{ist-1}$		-0.263***	
		(0.032)	
Δ_{15}PTAshare$_{ist-1}$			-0.218***
			(0.081)
Observations	2,342,442	1,949,479	386,790
First-stage F-stat	53,911	37,874	28,446
Importer x year FE	Yes	Yes	Yes
6-digit HS x importer FE	Yes	No	No
6-digit HS x year FE	Yes	Yes	Yes

Notes: Clustered standard errors at the importer/6-digit HS level are in parentheses. ***, ** and * indicate 1 percent, 5 percent and 10 percent significance levels, respectively. All regressors are 3-year averages and the dependent variable is the next period's NTM stock.

Table B9: NTM Flows and PTA Shares – IV Results

	NTM Flows			Trade-weighted NTM Flows		
	Level	SD	LD	Level	SD	LD
Dep. Variable:	NTM_{ist}	ΔNTM_{ist}	$\Delta_{15} NTM_{ist}$	NTM_{ist}	ΔNTM_{ist}	$\Delta_{15} NTM_{ist}$
NTM flows	(B1)	(B2)	(B3)	(B4)	(B5)	(B6)
PTAshare$_{ist-1}$	-0.230***			-0.221***		
	(0.034)			(0.031)		
ΔPTAshare$_{ist-1}$		-0.322***			-0.330***	
		(0.041)			(0.038)	
Δ_{15}PTAshare$_{ist-1}$			-0.384***			-0.298***
			(0.055)			(0.051)
Observations	2,342,442	1,949,479	386,790	2,342,442	1,949,479	386,790
First-stage F-stat	53,911	37,874	28,446	53911	37874	28446
Importer x year FE	Yes	Yes	Yes	Yes	Yes	Yes
6-digit HS x importer FE	Yes	No	No	Yes	No	No
6-digit HS x year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Clustered standard errors at the importer/6-digit HS level are in parentheses. ***, ** and * indicate 1 percent, 5 percent and 10 percent significance levels, respectively. All regressors are 3-year averages and the dependent variable is the next period's NTM flows.

Table B10: NTMs and PTA Shares – High versus Low Preferential Margins for PTA vs. Non-PTA Partner NTMs

Panel A	NTM Target: PTA Partners					
	Level		SD		LD	
Dep. Variable:	NTM_{ist}		ΔNTM_{ist}		$\Delta_{15} NTM_{ist}$	
	(B1)	(B2)	(B3)	(B4)	(B5)	(B6)
Preferential margin by country:	High	Low	High	Low	High	Low
PTAshare$_{ist-1}$	-1.034***	0.113**				
	(0.115)	(0.056)				
ΔPTAshare$_{ist-1}$			-0.902***	-0.049		
			(0.077)	(0.036)		
Δ_{15}PTAshare$_{ist-1}$					-1.454***	0.343***
					(0.174)	(0.097)
Observations	788,238	1,515,843	682,417	1,266,881	144,530	242,208
First-stage F-stat	13,621	35,076	11,347	26,313	9,603	17,616
Coefficient equality test p-val	0.000		0.000		0.000	
Importer x year FE	Yes	Yes	Yes	Yes	Yes	Yes
6-digit HS x importer FE	Yes	Yes	No	No	No	No
6-digit HS x year FE	Yes	Yes	Yes	Yes	Yes	Yes

Panel B	NTM Target: Non-PTA Partners					
	Level		SD		LD	
Dep. Variable:	NTM_{ist}		ΔNTM_{ist}		$\Delta_{15} NTM_{ist}$	
	(B7)	(B8)	(B9)	(B10)	(B11)	(B12)
Preferential margin by country:	High	Low	High	Low	High	Low
PTAshare$_{ist-1}$	-0.796***	0.184***				
	(0.110)	(0.057)				
ΔPTAshare$_{ist-1}$			-0.772***	-0.002		
			(0.075)	(0.037)		
Δ_{15}PTAshare$_{ist-1}$					-1.136***	0.402***
					(0.167)	(0.099)
Observations	788,238	1,515,843	682,417	1,266,881	144,530	242,208
First-stage F-stat	13,621	35,076	11,347	26,313	9,603	17,616
Coefficient equality test p-val	0.000		0.000		0.000	
Importer x year FE	Yes	Yes	Yes	Yes	Yes	Yes
6-digit HS x importer FE	Yes	Yes	No	No	No	No
6-digit HS x year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Clustered standard errors at the importer/6-digit HS level are in parentheses. ***, ** and * indicate 1 percent, 5 percent and 10 percent significance levels, respectively. The average 2001 MFN tariff cutoff between samples is .087 (in ad valorem terms). All regressors are 3-year averages and the dependent variable is the next period's NTM stock.

Table B11: NTMs and PTA Shares – High versus Low 2001 MFN Tariffs

	Level		SD		LD	
Dep. Variable:	NTM_{ist}		ΔNTM_{ist}		$\Delta_{15} NTM_{ist}$	
	(B1)	(B2)	(B3)	(B4)	(B5)	(B6)
MFN tariff level by country:	High	Low	High	Low	High	Low
PTAshare$_{ist-1}$	-0.929***	0.114**				
	(0.122)	(0.056)				
ΔPTAshare$_{ist-1}$			-1.056***	0.012		
			(0.087)	(0.036)		
Δ_{15}PTAshare$_{ist-1}$					-1.651***	0.384***
					(0.197)	(0.097)
Observations	807,281	1,534,501	671,688	1,277,241	132,935	253,745
First-stage F-stat	15,666	36,717	10,376	26,852	8,659	18,385
Coef. equality test p-val	0.000		0.000		0.000	
Importer x year FE	Yes	Yes	Yes	Yes	Yes	Yes
6-digit HS x importer FE	Yes	Yes	No	No	No	No
6-digit HS x year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Clustered standard errors at the importer/6-digit HS level are in parentheses. ***, ** and * indicate 1 percent, 5 percent and 10 percent significance levels, respectively. All regressors are 3-year averages and the dependent variable is the next period's NTM stock.

Table B12: NTMs and PTA Shares – SPS/TBT PTA Provisions

Dep. Variable:	NTM_{ist}	ΔNTM_{ist}	$\Delta_{15} NTM_{ist}$	NTM_{ist}	ΔNTM_{ist}	$\Delta_{15} NTM_{ist}$
	(B1)	(B2)	(B3)	(B4)	(B5)	(B6)
SPS/TBT depth:		Low			High	
PTAshare$_{ist-1}$	-0.064			-0.710***		
	(0.080)			(0.096)		
ΔPTAshare$_{ist-1}$		0.117***			-0.636***	
		(0.044)			(0.053)	
Δ_{15}PTAshare$_{ist-1}$			0.033			-0.851***
			(0.121)			(0.126)
Observations	1,070,295	890,874	174,990	1,210,177	1,044,383	211,800
First-stage F-stat	25,049	20,515	14,497	18,259	18,278	14,404
Importer x year FE	Yes	Yes	Yes	Yes	Yes	Yes
6-digit HS x importer FE	Yes	Yes	No	No	No	No
6-digit HS x year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Clustered standard errors at the importer/6-digit HS level are in parentheses. ***, ** and * indicate 1 percent, 5 percent and 10 percent significance levels, respectively. The cutoff between samples is an SPS/TBT depth value of 1.5 (out of 2). All regressors are 3-year averages and the dependent variable is the next period's NTM stock.

Table B13: NTMs and PTA Shares – PTA Depth (Legally Enforceable Provisions)

	Level		SD		LD	
Dep. Variable:	NTM_{ist}		ΔNTM_{ist}		$\Delta_{15} NTM_{ist}$	
	(B1)	(B2)	(B3)	(B4)	(B5)	(B6)
PTA depth - legally enforceable:	High	Low	High	Low	High	Low
PTAshare$_{ist-1}$	-0.465***	-0.349***				
	(0.084)	(0.089)				
ΔPTAshare$_{ist-1}$			-0.537***	0.021		
			(0.051)	(0.045)		
Δ_{15}PTAshare$_{ist-1}$					-0.696***	-0.045
					(0.121)	(0.127)
Observations	1,067,236	1,208,913	915,705	1,019,552	192,416	194,374
First-stage F-stat	23,293	22,696	19,380	19,162	15,586	13,697
Coefficient equality test p-val	0.342		0.000		0.000	
Importer x year FE	Yes	Yes	Yes	Yes	Yes	Yes
6-digit HS x importer FE	Yes	Yes	No	No	No	No
6-digit HS x year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Clustered standard errors at the importer/6-digit HS level are in parentheses. ***, ** and * indicate 1 percent, 5 percent and 10 percent significance levels, respectively. The cutoff between samples is 10.441 legally enforceable PTA provisions (out of 52) across a country's agreements. All regressors are 3-year averages and the dependent variable is the next period's NTM stock.

Table B14: NTMs and PTA Shares – Technical Standards vs. Non-technical Border Protections

Panel A	NTM Stocks					
	Technical Standards			Non-technical Border Protections		
	Level	SD	LD	Level	SD	LD
Dep. Variable:	NTM_{ist}	ΔNTM_{ist}	$\Delta_{15}NTM_{ist}$	NTM_{ist}	ΔNTM_{ist}	$\Delta_{15}NTM_{ist}$
	(B1)	(B2)	(B3)	(B4)	(B5)	(B6)
PTAshare$_{ist-1}$	-0.251***			0.032***		
	(0.043)			(0.011)		
ΔPTAshare$_{ist-1}$		-0.276***			0.024***	
		(0.028)			(0.009)	
Δ_{15}PTAshare$_{ist-1}$			-0.355***			-0.016
			(0.071)			(0.020)
Observations	2,342,442	1,949,479	386,790	2,342,442	1,949,479	386,790
First-stage F-stat	53,911	37,874	28,446	53911	37874	28446
Importer x year FE	Yes	Yes	Yes	Yes	Yes	Yes
6-digit HS x importer FE	Yes	No	No	Yes	No	No
6-digit HS x year FE	Yes	Yes	Yes	Yes	Yes	Yes

Panel B	Trade-weighted NTM Stocks					
	Technical Standards			Non-technical Border Protections		
	Level	SD	LD	Level	SD	LD
Dep. Variable:	NTM_{ist}	ΔNTM_{ist}	$\Delta_{15}NTM_{ist}$	NTM_{ist}	ΔNTM_{ist}	$\Delta_{15}NTM_{ist}$
	(B7)	(B8)	(B9)	(B10)	(B11)	(B12)
PTAshare$_{ist-1}$	-0.206***			0.024***		
	(0.039)			(0.008)		
ΔPTAshare$_{ist-1}$		-0.253***			0.012**	
		(0.027)			(0.005)	
Δ_{15}PTAshare$_{ist-1}$			-0.269***			0.031**
			(0.066)			(0.014)
Observations	2,342,442	1,949,479	386,790	2,342,442	1,949,479	386,790
First-stage F-stat	53,911	37,874	28,446	53911	37874	28446
Importer x year FE	Yes	Yes	Yes	Yes	Yes	Yes
6-digit HS x importer FE	Yes	No	No	Yes	No	No
6-digit HS x year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Clustered standard errors at the importer/6-digit HS level are in parentheses. ***, ** and * indicate 1 percent, 5 percent and 10 percent significance levels, respectively. All regressors are 3-year averages. The dependent variable is the next period's NTM stock in panel A and the next period's trade-weighted NTM stock in panel B. Technical standards include SPS, TBT and pre-shipment inspection measures; non-technical border protections contain TTBs, quantity controls, price controls and finance measures.

Table B15: NTM Usage – High versus Low Frequency

Dep. Variable:	Level NTM_{ist}		SD ΔNTM_{ist}		LD $\Delta_{15} NTM_{ist}$	
	(B1)	(B2)	(B3)	(B4)	(B5)	(B6)
NTM Usage:	High	Low	High	Low	High	Low
PTAshare_{ist-1}	-0.514***	-0.224***				
	(0.085)	(0.061)				
$\Delta\text{PTAshare}_{ist-1}$			-0.416***	-0.249***		
			(0.060)	(0.042)		
$\Delta_{15}\text{PTAshare}_{ist-1}$					-0.935***	-0.271**
					(0.136)	(0.106)
Observations	1,147,897	1,194,545	954,186	995,293	188,055	198,735
First-stage F-stat	26,492	29,565	16,446	22,610	14,247	14,666
Coefficient equality test p-val	0.005		0.022		0.000	
Importer x year FE	Yes	Yes	Yes	Yes	Yes	Yes
6-digit HS x importer FE	Yes	Yes	No	No	No	No
6-digit HS x year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Clustered standard errors at the importer/6-digit HS level are in parentheses. ***, ** and * indicate 1 percent, 5 percent and 10 percent significance levels, respectively. The cutoff between samples is an average of 2.662 NTMs per HS code for a given importer. All regressors are 3-year averages and the dependent variable is the next period's NTM stock.

Table B16: NTMs and PTA Shares – IV Results without Agriculture

Dep. Variable:	Level NTM_{ist}	SD ΔNTM_{ist}	LD $\Delta_{15} NTM_{ist}$
	(B1)	(B2)	(B3)
PTAshare_{ist-1}	-0.248***		
	(0.040)		
$\Delta\text{PTAshare}_{ist-1}$		-0.169***	
		(0.028)	
$\Delta_{15}\text{PTAshare}_{ist-1}$			-0.280***
			(0.071)
Observations	2,031,065	1,692,145	337,961
First-stage F-stat	46,185	32,316	24,579
Importer x year FE	Yes	Yes	Yes
6-digit HS x importer FE	Yes	No	No
6-digit HS x year FE	Yes	Yes	Yes

Notes: Clustered standard errors at the importer/6-digit HS level are in parentheses. ***, ** and * indicate 1 percent, 5 percent and 10 percent significance levels, respectively. All regressors are 3-year averages and the dependent variable is the next period's NTM stock.

Table B17: NTMs and PTA Shares – Variable vs. Fixed PTA Shares

Dep. Variable:	Level NTM_{ist} (B1)	SD ΔNTM_{ist} (B2)	LD $\Delta_{15} NTM_{ist}$ (B3)
PTAshare$_{ist-1}$	-0.511***		
	(0.078)		
PTAshare$_{ist-1}$ – fixed	-0.244***		
	(0.093)		
ΔPTAshare$_{ist-1}$		-0.406***	
		(0.053)	
ΔPTAshare$_{ist-1}$ – fixed		0.020	
		(0.064)	
Δ_{15}PTAshare$_{ist-1}$			-0.955***
			(0.136)
Δ_{15}PTAshare$_{ist-1}$ – fixed			0.733***
			(0.151)
Observations	1,996,653	1,661,604	329,697
First-stage F-stat	10,214	8,306	5,165
Importer x year FE	Yes	Yes	Yes
6-digit HS x importer FE	Yes	No	No
6-digit HS x year FE	Yes	Yes	Yes

Notes: Clustered standard errors at the importer/6-digit HS level are in parentheses. ***, ** and * indicate 1 percent, 5 percent and 10 percent significance levels, respectively. All regressors are 3-year averages and the dependent variable is the next period's NTM stock.