Phase Out Tariffs, Phase In Trade?*

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Abstract

What causes US trade with Mexico and Canada to continue growing faster, for upto a decade, relative to countries with which the US does not have a Free Trade Agreement (FTA)? Baier and Bergstrand (2007) suggest that tariff phase-outs and delayed pass through of tariffs into import prices could cause such prolonged differential import growth. We examine how tariff cuts negotiated under the Canada-US Free Trade Agreement (CUSFTA) and North American Free Trade Agreement (NAFTA) affected US import growth in 1989-2017 using detailed product-level data on tariff stagings in the original treaties. We find essentially no evidence for the tariff phase-out or delayed pass through explanations.

Keywords: Free Trade Agreements, CUSFTA, NAFTA, trade, phase out.

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1 Introduction

The US administration recently started renegotiating the terms of the North American Free Trade Agreement (NAFTA) with partner countries Canada and Mexico, threatening to terminate the agreement if the US does not obtain more favorable concessions. NAFTA came into effect in 1994 and incorporates the earlier US-Canada Free Trade Agreement (CUSFTA) that was enforced in 1989. Being among the world's largest trade agreements, understanding the economic outcomes of NAFTA is important not only in the current political debate, but also for trade policy analysts and economists in general. Indeed, CUSFTA/NAFTA have been extensively studied to determine how FTAs affects their members' international trade, output, prices, welfare, and more generally the winners and losers of globalization (e.g. Trefler (2004), Romalis (2007) and Caliendo and Parro (2015)).

However, a simple glance at how CUSFTA/NAFTA's trade flows have evolved over time reveals a well-known puzzle that, to the best of our knowledge, has not yet been addressed in the literature. Figure 1 shows the growth rate of the universe of US imports from Mexico, Canada, and the Rest-of-the-World (ROW) as of CUSFTA's enforcement in 1989. Here, ROW excludes Canada and Mexico as well as China and countries with which the US formed a Free Trade Agreement over the sample period.[1] The figure reveals that US imports from Mexico started growing more rapidly, and more rapidly relative to ROW, once NAFTA was signed in late 1992 and this effect does not level off until the early 2010s. A similar story holds for US imports from Canada, although the impacts are much less pronounced and only last for about 15 years after NAFTA and largely disappear around the great trade collapse in the late 2000s. While the phenomenon of FTAs having delayed effects on trade flows goes back to Baier and Bergstrand (2007) (hereafter, BB), there is no systematic evidence on the roots of why FTAs take so long to fully impact trade flows.

What explains these prolonged differential growth rates of real trade flows, long after CUSFTA/NAFTA came into effect? BB (pp.89-90) suggest two hypotheses. Their first

[1] Section 3 provides background information about the import programs.

hypothesis revolves around the observation that "... virtually every Free Trade Agreement (FTA) is 'phased-in,' typically over 10 years". They describe that the original EEC agreement of 1958 had a 10-year phase-in and that NAFTA had a similar 10-year provision. As such, one could naturally expect the impact of an FTA on trade flows to play out gradually over time as the FTA actually removes bilateral tariffs. Their second hypothesis revolves around the possibility that changes in tariffs may only be passed through to prices gradually over time. If this is the case, the terms-of-trade will similarly adjust gradually over time and one could again naturally expect the impact of an FTA on trade flows to play out over time as tariff cuts filter through the terms-of-trade. This paper, to the best of our knowledge, is the first to explore the relevance of the "tariff phase out" and "delayed terms of trade" hypotheses as explanations for the delayed impact of FTAs on trade flows.

To empirically examine why FTAs bring delayed growth of trade flows, we examine CUSFTA and NAFTA to determine how different types of tariff phase-outs affect trade flows and the terms-of-trade. We do so by confronting the universe of the US' product-level trade data with detailed information about the tariff phase-out staging categories originally agreed upon by the US in the CUSFTA and NAFTA agreements. We use a difference-in-difference-in-difference, or triple difference (DDD) approach from the applied microeconometrics literature dating back to Gruber (1994) who investigated the cost pass through of state-level health insurance mandates regarding maternity benefits on wages of married women. The DDD approach allowed Gruber (1994) to look at the relative wage impacts on married women in states with mandates vis-a-vis states without mandates and, to control for state specific shocks, relative to the relative wage impact on a control group of males in states with mandates vis-a-vis states without mandates. The DDD approach has been used more recently, for example, by Kellogg and Wolff (2008) to analyze the impact of daylight saving on electricity usage and Chetty et al. (2009) to examine the impact of tax-inclusive product pricing by supermarkets on consumer spending behavior.

The DDD approach applies naturally in our tariff phase out context. Essentially, our empirical strategy looks at relative import growth from NAFTA partners, vis-a-vis the rest of the world, of products whose tariffs are being phased out and, to control for broader non-tariff related NAFTA effects, relative to relative import growth from NAFTA partners, vis-a-vis the rest of the world, of products whose tariff are duty free pre- and post-NAFTA. More generally, our approach allows us to flexibly control for a myriad of potentially confounding factors because we can use exporter-year fixed effects (to control for time-varying demand and/or supply shocks in exporting countries), country-product fixed effects (to control for country-product specific characteristics) and product-year fixed effects (to control for time-varying shocks to global product demand and/or supply). Change!

Our central finding is that there is evidence to support the idea that tariff phase outs, but not delayed terms of trade effects, can help explain the delayed growth in trade flows typically observed following FTA formation. When looking at the impact of tariff phase outs on imports, we find that products whose tariffs are being phased out grow more. Thus, import growth following FTAs is, to a non-trivial degree, related to tariff cuts. Moreover, import growth takes longer to stabilize for products whose tariffs are being phased out over a longer period. And, comfortingly, the magnitude of the effects that we find, both across products within a country of different phase out duration and across countries for products with the same phase out duration, are consistent with differences in the actual country-product specific tariff cuts embodied in NAFTA. In contrast, there is essentially no evidence of delayed terms of trade effects.

The remainder of this paper is structured as follows. Section 2 presents the related literature. Section 3 presents the data, including detailed discussion and description of how CUSFTA and NAFTA phased out tariffs. Section 4 explains our empirical strategy and Section 5 presents the results. Finally, Section 6 concludes.

2 Literature

According to Kowalczyk and Davis (1998), the practice of allowing for tariff phase-outs as opposed to full and immediate trade liberalization was first introduced in the General Agreement on Tariffs and Trade (GATT)' negotiation rounds—especially during the 1960s and 1970s. While the phase-in periods were generally restricted to 5 years for Most Favored Nation (MFN) tariffs, trade agreements under Article XXIV GATT allowed for considerably longer "adjustment periods". It was only with the "Understanding on the Interpretation of Article XXIV GATT 1994" that parties agreed that the maximum phase-in period in trade agreements should in principle not last longer than 10 years (p. 7-10).

While phase-out tariffs have been familiar to trade economists for decades, incorporation of this practice in empirical work has (somewhat ironically) been delayed. In their seminal article, BB introduce "phase-in" effects for FTAs in the gravity model of international trade. One of their central arguments is that the trade liberalization embodied in FTAs is not immediately and fully effective upon its implementation. Instead, tariffs will only be gradually phased out over a 5-10 year period for most products. BB argue that empirical work with the gravity equation should therefore, in addition to the familiar contemporaneous binary FTA variable, also include one or more lagged FTA variables spanning the entire period in which the FTA will be phased in. In doing so for a sample of 96 counties covering 1960-2000, they find that "on average, an FTA approximately doubles two members' bilateral trade after 10 years" (BB p.74).

By now, inclusion of BB's lagged FTA terms has become the standard in applied work (see, for example, Baier et al. (2014) and Kohl (2014)) and there is consensus that lagged FTA terms do indeed yield positive and statistically significant effects on bilateral trade for 5-10 years after the FTA enter into force. However, a striking limitation of these studies is that they do not explicitly demonstrate the causal relationship between product-level tariff phase-outs and product-level trade. A major drawback in this regard is that the product staging categories are extremely detailed and cannot readily be incorporated in terms

studies spanning multiple countries and FTAs. At best, the lagged FTAs in aggregate studies can be *assumed* to capture the delayed trade growth stemming from tariff phase-outs, but cannot be interpreted as evidence of a causal relationship.

Another explanation for the delayed growth of FTA-induced trade is BB's reference to "a large literature on delayed terms-of-trade effects". The most relevant paper we could find in this regard is McPheters and Stronge (1979). The authors review the literature on the so-called 'J curve', i.e. following a country's currency devaluation (akin to an improvement of the terms of trade following an import tariff reduction), the trade balance will temporarily deteriorate due to fixed short-term contracts before it improves. Consistent with earlier empirical work, their study confirms a lag between price changes and trade balance effects for 2-5 years. While the analogy is not entirely accurate in the context of phase-out tariffs, this literature suggests that a decrease in tariffs will only be followed by a relative change in trade flows after some delay.

More recent literature has explored how FTAs affect the terms of trade. For NAFTA, Romalis (2007) finds only modest effects on prices, but does not specifically account for tariff stagings ~~in the FTA~~. Anderson and Yotov (2016) provide an extensive review of the growing literature on FTAs and TOT effects, finding slight improvements in the terms of trade for all NAFTA members and especially for Mexico. Yet, none of these papers shed light on the exact timing of when the delayed TOT effects should become effective. The existing literature also does not directly addresses the question whether and how tariff stagings in FTAs affect a country's terms of trade—the central question that the remainder of this paper sets out to address for the CUSFTA and NAFTA.

3 Data

3.1 U.S. import data

For most of our analysis, we use product level U.S. import data from the USITC.[2] These data report bilateral U.S. imports at the 10-digit HS level from each foreign country over the period 1989-2016. The universe of such 10-digit bilateral import observations is $7,738,172$ when disaggregated by import program (e.g. NAFTA, GSP, etc.).We aggregate these 10-digit HS data to 8-digit HS data to match the product level staging categories in the NAFTA tariff schedules.

Before aggregation, we drop four types of observations. First, we drop the $5,371$ observations with an import program of "Unknown country" (0.005% of imports). Second, because our analysis will use unit values, we then drop the 3.69% of observations (8.7% of imports) where, at the exporter-year level, an 8-digit product is measured in different units (e.g. volume and weight) across observations. In all such cases, multiple 10-digit codes lie within the 8-digit code. Third, again due to our use of unit values, we then drop the 0.9% of observations (0.003% of imports) where, at the exporter level, an 8-digit product is measured in different units across years. In all such cases, there are different 10-digit codes across years that lie within the given 8-digit code. Finally, we then drop the 0.006% of observations (0.003% of imports) with positive quantities even though the USITC quantity description says the product has no quantity dimension. Ultimately, this leaves $7,378,515$ observations.

3.2 Tariff schedules

3.2.1 CUSFTA and NAFTA

To ascribe the effect of tariff phase-outs on trade flows, we extract the product-level staging categories from the original and publicly available CUSFTA and NAFTA treaties. Each treaty contains a tariff schedule for each member. For CUSFTA, these tariff schedules are

[2] We use the import data provided by the USITC as "imports for consumption".

introduced and explained in Chapter 3: *Border Measures* by Article 401: *Tariff Elimination*, but separately attached as Annex 401.2 with the U.S. tariff schedule running 509 pages. For NAFTA, the tariff schedules are introduced in Chapter 4: *National Treatment and Market Access for Goods* by Annex 302.2: *Tariff Elimination of NAFTA*, but they are separately attached to Annex 302.2 with the U.S. tariff schedule running 734 pages. The tariff schedules contain the product-level staging categories that govern how each member phases out tariffs on the other member(s) upon NAFTA entering into force on January 1, 1994.

Table 1 describes these staging categories. As explained by NAFTA Annex 302.2(1), NAFTA contains five standard staging categories used by each NAFTA partner in their respective Annex 302.2 tariff schedule. Staging category A immediately cuts tariffs to 0 while staging category D reflects products that were already duty free pre-NAFTA and, hence, continue duty free post-NAFTA. The other three staging categories phase out tariffs over time in equal annual stages from the "base rate" which is defined as the USHTS Column 1 tariff on July 1, 1991, per General Note 2 of the U.S. tariff schedule in Annex 302.2. Staging category B does this over five years (i.e. a first cut on January 1, 1994, and duty free after the fifth cut on January 1, 1998) while staging categories C and C+ do this over 10 and 15 years respectively. For the U.S. tariff schedule, Columns (3)-(4) of Table 1 show the breakdown of HS8 products across these staging categories. 51.2% of products have their tariff immediately cut to 0 and a further 15.0% of products continue duty free. Additionally, 8.5% of products have a 10 year phase out while only 2.0% have a 5 year phase out and 0.8% have a 15 year phase out. From this perspective, the 10 year phase out products represent the main products that the U.S. actually phased out over time.

Unfortunately, the U.S. NAFTA tariff schedule often breaks a given 8-digit product into various sub-products identified by letters with sub-products having different staging categories. For example, 0707.00.50 represents Cucumbers imported during May-June or September-November but the U.S. tariff schedule assigns staging category C+ to 0707.00.50A (defined as imports during May or October-November) but staging category B to 0707.00.50B (defined as imports during June or September). Table 1 shows "Mixed" products account for a non-trivial 12.7% of products in the U.S. tariff schedule.

In addition to the five standard staging categories and the "Mixed" category, members have member-specific staging categories. Annex 300-B of the NAFTA treaty governs textile and apparel goods and defines staging category B6 utilized by the US. Specifically, Appendix 2.1.B(b) of Annex 300-B explains that these B6 products have their tariff reduced on January 1, 1994, by "an amount equal, in percentage terms, to the base rate" and then in five equal annual stages beginning on January 1, 1995. Table 1 shows that B6 products represent 8.2% of products in the U.S. tariff schedule. The final staging category used by the U.S. is C10. Specified in the U.S. tariff schedule attached to Annex 302.2, these products have their tariff cut non-linearly to 0 over 10 years: a 20% cut on January 1, 1994, followed by eight equal annual cuts beginning on January 1, 1996. Table 1 shows such products account for only 0.8% of products. Ultimately, Columns (3)-(4) suggest that B6 and C products account for essentially all products, and equally so, where the U.S. phases out tariffs over time.

However, this view changes somewhat when looking at the distribution of total US imports, i.e. including imports from non-NAFTA countries, over the time period 1989-2016 across these staging categories. Columns (9)-(10) in Panel C of Table 1 show that 17.5% of imports fall in staging category C and only 2.7% and 0.8%, respectively, in B6 and B. Thus, 10 year phase outs account for the vast bulk of imports where the U.S. phases out tariffs over time. Additionally, relative to the product distribution in columns (3)-(4) of Panel B, staging category D becomes more important (21.1% of imports versus 15.0% of products) and staging category A less important (41.4% of imports versus 51.2% of products).

While the above discussion suggests that a products' tariff is phased out on U.S. imports from both Mexico and Canada in the same way, pre-NAFTA preferential arrangements of the U.S. with Canada and Mexico imply otherwise. First, Annex 302.2(12) states that the U.S. must apply a product-level tariff on Canada no higher than it specified in its CUSFTA Annex 401.2 tariff schedule. That is, for US imports from Canada, NAFTA can accelerate but not relax a product's CUSFTA tariff phase out. Second, Annex 302.2(2) states that the base rate for purposes of U.S. tariff phase outs must respect Mexico's status under the U.S. Generalized System of Preferences (GSP). Further, this requirement relates to Mexico's 1991 GSP status with its GSP status removed on January 1, 1994.[3] Since Mexican products eligible for the GSP program enter the U.S. duty free, any U.S. imports on GSP eligible products from Mexico therefore continued duty free after NAFTA.[4] These two features of pre-NAFTA U.S. preferential tariff policy have substantial implications for the allocation of products to staging categories.

In Table 1, columns (5)-(8) of Panel B and columns (11)-(14) of Panel C illustrate. For Mexico, 47.3% of products (accounting for 32.7% of US imports, including from non-NAFTA countries) were GSP eligible. However, the NAFTA U.S. tariff schedule assigns 85.2% of these GSP-eligible products to staging category A, with an immediate tariff cut to zero, and a further 13.4% of these GSP-eligible products to the "Mixed" staging category. In turn, Mexico's GSP eligibility reduces the share of Mexican imported products with their tariff immediately cut to 0 from a prima facie 51.2% (41.4% of US imports) to 11.1% (18.1% of US imports) and also reduces the 12.7% (14.4% of US imports) of "Mixed" products to 6.3% (5.6% of US imports). In terms of products where NAFTA phases out tariffs on Mexican imports over time, 17.3% of US imports fall in staging category C while 2.7% and 1.2% fall in, respectively, B6 and C10 and less than 1% fall in, respectively, B and C+.

To understand the implications of CUSFTA for the U.S. NAFTA staging categories, Columns (1)-(2) of Table 1 first describe the U.S. CUSFTA tariff schedule. More simple than NAFTA, CUSFTA consisted of only the A, B, C and D staging categories. Similar to NAFTA, 15.1% of products continued duty free and 8.7% of products were "Mixed" (i.e. their 8-digit product split was into sub-products identified by letters and different staging categories). However, in stark contrast to NAFTA, only 3.7% of products had their tariff

[3] See US CBP and Glick (2010, p.11).

[4] To establish Mexico's 1991 product level GSP eligibility, we use the 1991 USITC tariff data collected by John Romalis and described in Feenstra et al. (2002). This data has an 8-digit product indicator for GSP eligibility and also information on country-product specific exclusions from GSP eligibility.

immediately cut to 0 while 26.7% and 45.9% of products faced, respectively, 5 and 10 year phase outs. Thus, the U.S. phased out tariffs over time for over 70% of products in CUSFTA.

These CUSFTA phase outs modify the prima facie U.S. NAFTA tariff phase outs on imports from Canada. Table 1 shows that the share of products having their tariff immediately cut to 0 basically falls in half, from 51.2% to 28.7% (from 41.4% of US imports to 18.6%). Indeed, all of the affected products are reclassified as continue duty free: of these reclassifications, over 85% stem from a 5-year CUSFTA phase out implying the product became duty free on January 1, 1993, and nearly 15% stem from CUSFTA immediately cutting their tariff to 0 on January 1, 1989. Additionally, the share of "Mixed" products falls by 4.1% points with these products reclassified as continue duty free because of, largely, 5-year CUSFTA phase outs. Overall, these changes triples the share of continue duty free products from 15% to 43.8% (21.1% to 60.6% of US imports).

CUSFTA also impacts the extent of NAFTA tariffs phased out over time. The vast majority of products receiving 10 year equal annual phase out under NAFTA also had the same staging category under CUSFTA. Thus, CUSFTA would have eliminated their tariffs as of January 1, 1999. In turn, these Canadian imported products face equal annual NAFTA cuts for 5 years beginning on January 1, 1994. This increases the share of staging category B products from 2% to 9% (0.8% to 5% of US imports) but reduces the share of C products from 8.5% to 1.1% (17.5% to 1% of US imports). Thus, in terms of products where NAFTA phases out tariffs on Canadian imports over time, 5% of US imports fall in staging category B while 2.7% and 1% fall in, respectively, staging categories B6 and C. Ultimately, CUSFTA has non-trivial implications for the NAFTA staging categories applied to Canadian imports.[5,6]

CUSFTA also has implications for the NAFTA tariff cuts received by Canada and Mexico. Given the CUSFTA tariff concessions received by Canada, its subsequent NAFTA tariff concessions are fairly moderate, especially compared to the tariff concessions received by Mexico. Table 2 shows that Canadian products with tariffs immediately cut to zero have an average tariff cut of 2.6% compared to 7.5% for Mexico. For products whose tariff is phased out over 5-6 years, the total tariff cut is around 5-6% for Canada versus around 9-13% for Mexico. In turn, the respective annual average tariff cuts are around 1% compared to around 2%. The 735 Mexican products whose tariff is phased out over 10 years enjoy a total tariff cut of 7.6%, so around 0.76% on average annually. Importantly, even though Mexico enjoys much larger tariff concessions than Canada, products with longer phase outs generally enjoy larger total tariff cuts but smaller annual tariff cuts.

3.2.2 Matching tariff schedules to trade data

Matching issues arise when merging the NAFTA staging category data with the 8-digit USITC import data. One on hand, 91 products from the NAFTA tariff schedule do not appear in the USITC trade data over our sample period of 1989-2016. Of these products, 76 come from Chapter 98 *Special Classification Provisions* and a further 11 come from dairy products in Chapter 4. These products are not included in Table 1; that is, Table 1 only includes products from the NAFTA tariff schedule that also appear in our USITC import

[5] Of the 66 products listed as having a "missing" staging category in Columns (3)-(4) of Table 1, 37 had a non-linear phase out that was not associated with a particular staging category. For example, 0703.90.00 represents "Leeks and other alliaceous vegetables" and had its tariff cut from a base rate of 25% to 14.4% on January 1, 1994, and then, essentially, had its tariff phased out over 5 equal annual cuts. A further 27 products were sets of articles (e.g. tools, textile ensembles, watch parts) where the staging category applied either to each individual item separately or the complete item specified elswhere. For example, 6103.22.00 which represents "Men's or Boy's cotton suit ensembles". The final two products were articles re-entering after being sent abroad for further processing or assembly out of US parts. For the value of imports here, the tariff applies as if the entire article itself was imported.

In CUSFTA, the 2 "missing" products were phased out in 3 equal annual cuts beginning January 1, 1989.

[6] When we construct Panel C of Table 1 using the number of observations at the exporter-product-year level rather than total imports aggregated from the exporter-product-year level, the distributions across staging categories looks extremely similar to those in Panel B. Thus, asymmetries between the distribution of imports and products across the staging categories drive the different distributions in Panels B and C.

data over our 1989-2016 sample period.

On the other hand, Table 3 shows that not all products in our USITC import data are in the NAFTA tariff schedule. Focusing on 1993 given NAFTA was signed in late 1992, Panel A shows 15 products are not in the U.S. tariff schedule out of the $8,690$ products imported into the U.S. That is, 99.83% of imported products in 1993 appear in the U.S. tariff schedule. Panel B shows the match rate is 99.71% when looking at 1993 exporter-product observations and Panel C shows the match rate is 98.85% when looking at import values. These respective match rates are slightly lower in the pre-NAFTA years of 1989-1992. Of the 15 products in the 1993 USITC import data that are not in the NAFTA tariff schedule, five products are not even in the 1993 USHTS. One is a very particular type of citrus or melon peel. Two are particular oganic amine-function chemical compounds. Two are particular types of wood doors. One is a type of iron or steel container normally carried by people in pockets or handbags. And, three are magnetic tape-type video recording or reproducing apparatus. As such, these omissions do not look like systematic attempts to exclude politically sensitive sectors or products from eventual tariff elimination.[7]

Naturally, the match rate between the NAFTA tariff schedule and USITC import data falls over time. First, the World Customs Organization (WCO) periodically updates HS codes at the 6-digit level (this happened in 1996, 2002, 2007 and 2012). Second, based on recommendations to the President, the USITC updates 10-digit HS codes each year. In the early post-NAFTA years, these USITC changes were substantial. Panel A of Table 3 shows the 99.83% pre-NAFTA match rate of 1993 falls to 94.42% in 1994 and 82.68% in 1995. Thereafter, the match rates decline noticeably only in years of WCO HS changes, declining to 68.43% in 2002, 62.70% in 2007 and 59.16% in 2012. Panels B and C of Table 3 show similar declines for exporter-product observations and import values. These facts motivate our desire to conduct analyses that focus on either HS codes that remain unchanged over

[7] The five products not in the initial version of the 1993 USHTS are 2921.42.26, 2921.42.28, 9021.19.85, 9999.00.15 and 9999.95.00. The other 10 products are 0814.00.80 (peel); 2921.42.21, 2921.42.22 and 2922.50.11 (chemical compounds); 4418.20.40 and 4418.20.80 (wood doors), 7326.90.35 (iron or steel container); and 8521.10.30, 8521.10.60 and 8521.10.90 (video apparatus).

time or concorded HS codes using an extended concordance based on Pierce and Schott (2012) that we do as robustness checks.

4 Empirical strategy

Our aim is to identify how the US phase out of product-level tariffs under NAFTA impacts its product-level imports from NAFTA partners. Two intuitive strategies come to mind immediately. First, one could compare product-level imports from NAFTA partners versus the rest of the world (ROW). Intuitively, any differential import flows in this “NAFTA versus ROW” approach would reflect the tariff phase out on NAFTA partners. Second, one could focus on imports from NAFTA partners and compare product-level imports for products whose tariff is phased out (“phase out” products) versus products whose tariff is zero both pre- and post-NAFTA (continue duty free, “CDF”, products). Intuitively, any differential in this “phase out versus CDF” approach would reflect the tariff phase out. However, each of these approaches is problematic.

Both the NAFTA versus ROW and phase out versus CDF approaches can be implemented as difference-in-difference (DID) specifications. However, the NAFTA versus ROW approach ignores the possibility that, after NAFTA, a product’s NAFTA imports grow relative to its ROW imports *regardless* of whether the product’s tariff is being phased out. This could be driven by positive supply shocks in the NAFTA partners or broad effects of NAFTA that go beyond tariff reduction. Formally, the DID estimator in this NAFTA versus ROW approach includes a fixed effect reflecting import growth from NAFTA partners, relative to ROW imports, regardless of whether the product’s tariff is being phased out. Conversely, the phase out versus CDF approach ignores the possibility that, after NAFTA, a phase out product’s imports grow relative to CDF products *regardless* of the exporting country. This could be driven, for example, through product-specific supply or demand shocks or the endogenous assignment of staging categories. Formally, the DID estimate in this phase out versus CDF approach includes a fixed effect reflecting import growth in phase out products, relative to CDF products, regardless of the exporting country. To avoid these problems with the intuitive NAFTA versus ROW and phase out versus CDF approaches, we use a triple difference (DDD) specification.

Specifically, the DDD specification is

$$
\begin{aligned}
(1) \quad \ln M_{pct} &= \alpha + \beta_1 Post_t + \beta_2 NAFTA_c + \beta_3 Phase_p \\
&\quad + \gamma_1 Post_t \times Phase_p + \gamma_2 Post_t \times NAFTA_c + \gamma_3 NAFTA_c \times Phase_p \\
&\quad + \delta Post_t \times NAFTA_c \times Phase_p + \varepsilon_{pct}.
\end{aligned}
$$

Here, $\ln M_{pct}$ represents US log imports of product p from country c in year t. Further, $NAFTA_c$, $Phase_p$ and $Post_t$ represent dummy variables indicating, respectively, (i) whether the exporting country c is a NAFTA partner, (ii) whether product p is a product whose tariff is phased out under NAFTA, and (iii) whether year t is in the post-NAFTA period of 1994 onwards. In all our analyses, we only include either Canada or Mexico as the single NAFTA country. The key coefficient of interest is the DDD coefficient δ and it has two equivalent interpretations. First, after controlling (via γ_2) for any post-NAFTA effects that impact imports from NAFTA partners across all products, δ reflects the differential import growth of phase out products from NAFTA countries relative to ROW. Second, after controlling (via γ_1) for any post-NAFTA effects that impact phase out product imports across all exporting countries, δ reflects the differential NAFTA partner import growth in phase out products relative to CDF products.

Although improving on the intuitive NAFTA versus ROW and phase out versus CDF approaches, this DDD specification in (1) still omits many potentially relevant variables. First, (1) controls for effects that differentially impact import growth, pre-NAFTA versus post-NAFTA, of phase out and CDF products via γ_1. But, it does not allow such effects to vary over time at an annual frequency nor across the various phase out products or the various

CDF products. Possible relevant factors that could vary at the product-year level include US production levels, Maquiladora production levels, import shares from US FTA partners or Canada and Mexico's FTA partners (which impact the relative degree of preferential access for NAFTA partners in the US), status under the WTO Multifibre Arrangement, and Chinese import competition in the US. Thus, we control for these potentially relevant factors, among others that vary at the product-year level, by adding a product-year fixed effect γ_{pt} to (1).

Second, (1) controls for effects that differentially impact import growth (pre-NAFTA versus post-NAFTA) from NAFTA partners versus ROW via γ_2. But, it does not allow such effects to vary over time at an annual frequency nor across ROW countries. Possible relevant factors that could vary at the country-year level include bilateral exchange rates between the US and the exporting country and the export country's WTO status. Thus, we control for these potentially relevant factors, among others that vary at the country-year level, by adding a country-year fixed effect γ_{ct} to (1).

Third, one may worry that a product's staging category for its tariff phase out is endogenous. If one were to investigate the determinants of a product's phase out status, the natural approach would be to run a cross-section regression using product-level data. Remembering that such negotiations concluded in 1992, key product-level variables could include factors such as lobbying or other measures of political importance, including the status quo level of protection, as of 1992. Additional relevant factors include measures relating to the extent of an export country's import penetration in the US and the degree of international competitiveness or revealed comparative advantage of the US and/or NAFTA partners as of 1992. Many such factors are already controlled for by the product-year fixed effect γ_{pt} but we also add a product-country fixed effect γ_{pc} to control for any time-invariant product characteristics specific to particular export countries that could drive endogenous staging assignment.

Adding these fixed effects to the DDD specification (1) yields the following fixed-effects

DDD specification:

$$\ln M_{pct} = \alpha + \delta Post_t \times NAFTA_c \times Phase_p + \gamma_{pt} + \gamma_{ct} + \gamma_{pc} + \varepsilon_{pct}. \tag{2}$$

Nevertheless, one could reasonably expect important heterogeneity in the DDD coefficient δ along two dimensions. First, as described in Section 3.2.1, some products are phased out over longer periods than others. Second, as is well-known in the literature, the impact of tariff cuts impact import growth over time. Hence, one could reasonably expect the impact of tariff cuts grow over time and depend on the length of a products tariffs phase out. Thus, we augment (2) in two ways. First, setting the base year as 1989, we estimate time varying DDD coefficients δ_t for all years $t \geq 1990$. Second, we redefine $Phase_p$ as a vector $Phase_p = (GSP_p, Immed_p, 5yr_p, 10yr_p)$ consisting of indicator variables for whether the product continues duty free because of the GSP program (GSP_p), has its tariff cut to zero immediately ($Immed_p$), has its tariff phased out over 5 or 6 years ($5yr_p$) or has its tariff phased out over at least 10 years ($10yr_p$). Using the indicator variable $I\{\cdot\}$, this yields our baseline DDD specification:

$$\ln M_{pct} = \alpha + \sum_{y=1990}^{2016} \delta_y \times I\{y = t\} \times Post_t \times NAFTA_c \times Phase_p + \gamma_{pt} + \gamma_{ct} + \gamma_{pc} + \varepsilon_{pct}. \tag{3}$$

5 Results

5.1 Tariff phase out

5.1.1 A simple means-based approach

To illustrate the mechanics of the DDD approach, we begin by presenting Table 4. Since the basic DDD approach in (1) is ultimately a comparison of mean import growth between phase out and CDF products and NAFTA partners and ROW, we present these data.

Panel A of Table 4 depicts the NAFTA versus ROW approach and motivates the necessity of a DDD approach over a DD approach. To begin, Panel A1 shows relative import growth of phase out products from a NAFTA partner vis a vis ROW. While mean log imports of phase out products from Mexico were 0.345 log points higher in the post-NAFTA period, mean log imports of phase out products from ROW were 0.244 log points *lower* in the post-NAFTA period. Thus, relative import growth from Mexico, vis a vis ROW, in phase out products was 0.589 log points and represents a DD estimate. A similar story holds for Canada. While mean log imports of phase out products from ~~Mexico~~ Canada were 0.335 log points higher in the post-NAFTA period, mean log imports of phase out products from ROW were 0.298 log points *lower* in the post-NAFTA period. Thus, relative import growth from Canada, vis a vis ROW, in phase out products was 0.633 log points and represents a DD estimate. From these DD perspectives, NAFTA tariff cuts appear to have substantial impacts on NAFTA trade flows.

However, this DD approach overestimates the impact of NAFTA tariff cuts. Specifically, Panel A2 shows that similar DD effects, although quantitatively weaker, emerge when looking at CDF products. Relative import growth from Mexico, vis a vis ROW, grew in CDF products by 0.326 log points and relative import growth from Canada, vis a vis ROW, grew in CDF products by 0.433 log points even though these CDF products did not receive tariff cuts. The fact that imports from NAFTA partners grow relative to ROW even for CDF products suggests important NAFTA specific effects on trade flows that go beyond tariff cuts. The DDD estimates take this into account by looking at the "excess" relative import growth of NAFTA partners vis a vis ROW in phase out products over CDF products. That is, the DDD estimates are differences in DD estimates. The DDD estimates says this excess relative import growth is 0.263 log points for Mexico and 0.200 log points for Canada. On one hand, the large DD point estimates in Panel A2 show the importance of controlling for a "NAFTA effect" that goes beyond tariff phase outs and motivates the importance of country-year fixed effects in our later analysis. Nevertheless, the non-trivial DDD point estimates show that tariff cuts were an important part of the NAFTA induced trade flow growth.

Panel B of Table 4 carries out the analysis performed in Panel A but from the phase out products versus CDF products approach. Panel B1 shows that Mexican relative import growth of phase out products vis a vis CDF products was actually -0.069 log points. That is, on average, Mexican imports of phase out products actually grew by less than Mexican imports of CDF products. Similarly, for Canada, relative import growth of phase out products vis a visa CDF products was -0.081 log points. These relative import growth numbers are DD estimates and, in and of themselves, suggest that NAFTA tariff cuts may have actually reduced NAFTA trade flows.

However, these DD effects understimate the impact of NAFTA tariff cuts. Specifically, Panel B2 shows much larger negative DD effects when looking at ROW relative import growth of phase out products vis a vis CDF products. Defining phase out products based on Mexico's NAFTA staging categories, ROW relative import growth of phase out vis a vis CDF products was -0.332 log points. And, defining phase out products based on Canada's NAFTA staging categories, ROW relative import growth of phase out vis a vis CDF products was -0.281 log points. The DDD estimates take this into account by looking at the "excess" relative import growth of phase out products vis a vis CDF products for NAFTA partner imports over ROW imports. That is, the DDD estimates are differences in DD estimates. As for the NAFTA versus ROW approach above, these DDD estimates say this excess relative import growth is 0.263 log points for Mexico and 0.200 log points for Canada. The very large DD point estimates in Panel B2 show the importance of controlling for systematic differences in phase out products versus CDF products and motivates the importance of product-year and product-country fixed effects in our later analysis. Nevertheless, again, the non-trivial DDD point estimates show that tariff cuts were an important part of the NAFTA induced trade flow growth.

5.1.2 Regression-based approach

While equation (1) is the standard DDD approach, one can exploit the richness of the setup by including a detailed set of fixed effects. As discussed in Section 4, we can include country-product, country-year and product-year fixed effects to control for a myriad of potentially confounding factors described in Section 4. Table 5 shows how controlling for these confounding factors matters. Columns (1) and (3) show the DDD estimates from equation (1). In particular, note how these DDD point estimates match those in Table 4 based on differences in means. Columns (2) and (4) show results from the fixed effects DDD specification of equation (2) with the point estimates increasing in magnitude by about 25-35%. Thus, controlling for additional factors through the detailed fixed effects appears important.

Figures 2 and 3 present the time varying DDD estimates from (3) when we split the phase out products into their different categories: immediate cut (A), 5 year phase out (B and B6), 10+ year phase out (C, C10 and C+) and GSP. Naturally, the last category GSP only applies to Mexican imports. The black line illustrates our hypothesis. Products whose tariff is cut immediately should see a large immediate growth in trade that remains stable thereafter. Products whose tariff is phased out over 5-6 years should see gradual trade growth that stabilizes after around 5-6 years. Products with a 10+ year phase out should see even more gradual trade growth that stabilizes after 10-15 years. Finally, to the extent that NAFTA removes any uncertainty about future eligibility for, or the existence of, the GSP program, Mexican GSP products should look similar to products whose tariff is immediately cut to zero: an immediate increase in trade that quickly stabilizes.

For Mexico, Figure 2 may initially seem broadly in line with the hypotheses just described. After NAFTA is signed in late 1992, panel (a) shows that immediate cut products experience trade growth of around 0.9 log points that stabilizes by the late 1990s. In contrast, panel (b) shows the 5 year phase out products experience even larger trade growth that eventually reaches around 1.25 log points and only stabilizes by the early 2000s. The longer time until trade flows stabilize is consistent with the longer phase out and the nearly 40% larger trade growth is consistent with the 30-50% larger tariff cuts of 5 year versus immediate cut products (see Table 2). Further, panel (c) shows the 10+ year phase out products experience trade growth that only stabilizes by the late mid-late 2000s. However, this is where any supporting evidence starts appearing weak. To begin, despite immediate cut products and 10+ year phase out products both having an average tariff cut of around 7.5% points, the former initially stabilize around 0.9 log points above their pre-NAFTA 1992 level whereas the latter only grown by around 0.4-0.6 log points. Further evidence that Figure 2 does not provide convincing support for the idea that tariff phase outs are important for understanding delayed trade flow growth comes from analyzing the extent to which we can detect imports growing over time. missing

Table 6 presents evidence regarding the extent to which we can detect imports growing over time. Using the DDD results from (2) that underlie Figure 2, Panel A shows the point estimates for annual import growth. While it is rather difficult to detect statistically significant changes in cumulative import growth at an annual frequency, this changes when smoothing annual volatility using multi-year rolling windows. Using a 3-year rolling window for import growth (i.e. import growth between year t and year $t-3$), Panel B shows import growth for immediate cut products of around 0.3-0.5 log points in all years between 1994 and 1999 with the caveat that we do not see import growth in 1996 relative to 1993. That is, statistically speaking, the post-NAFTA import growth of immediate cut products only stabilizes from 2000. Using this 3-year rolling window for import growth, 5-year phase out products grow about 0.3-0.6 log points beginning in 1995 and continuing every year until 2001. That is, statistically speaking, the post-NAFTA import growth for 5-year phase out products stabilizes from 2002. Ultimately, import growth of immediate cut products starts only one year earlier than 5-year phase out products and stabilizes essentially 7 years after NAFTA was signed which is only 2-years ahead of when 5-year phase out products stabilize. From this perspective, the dynamics of import growth for immediate cut products is remarkably similar to that of 5-year phase out products.

While the import growth dynamics of the 5-year phase out products reflect the expected gradual growth of having their tariff phased out, Panel C of Table 1 shows they account for only 3.3% of imports when classifying products per Mexico's staging categories. In contrast, the 10+ year phase out products account for 18.9% of such imports. That is, 85% of imports for products that are actually phased out according to Mexico's staging schedule are the 10+ year phase out products. Thus, to the extent that tariff phase outs help explain delayed import growth from Mexico, it should help explain delayed import growth for the 10+ year phase out products. However, even when looking at import growth over a 3-year rolling window, we can hardly detect import growth for these products. Relative to 3 years prior, we can only detect import growth in 1993 and 1997. This inability to detect robust import growth for the 10+ year phase out products also holds when using 2-year, 4-year or 5-year rolling windows.[8] Together with the magnitude of import growth of around 0.3-0.6 log points being much smaller than what we would expect based on the magnitude of import growth for immediate cut and 5-year phase out products together with the magnitude of tariff cuts for these three product groups, there is essentially no evidence that the 10+ year phase out products grow as one would expect based on a tariff phase out hypothesis.

The import growth dynamics of GSP-eligible products provide more evidence against the tariff phase out explanation for delayed import growth. NAFTA permanently and immediately removes the uncertainty that Mexico faces over tariff free access on GSP-eligible products by codifying Mexico's GSP-eligible products as staging category D that contunue duty free. Thus, as for immediate cut products, we expect an initial burst of import growth for GSP-eligible products with the cumulative growth impact stabilizing quickly.[9] Yet, Panel (d) of Figure 2 suggests GSP import growth after 1992 only kicks in by the late 1990s and

[8]For 2-year rolling windows, we detect import growth in 2003. For 4-year rolling windows, we detect import growth in 1993 and 2013. For **5**-year rolling windows, we detect import growth in 1993, 2003 and 2014.

[9]that stAs part of the broader and growing literature on trade policy uncertainty (e.g. Handley (2014), Pierce and Schott (2016) and Handley and Limão (2017)), S. (2017) documents the inherent legislative uncertainty surrounding GSP renewal and the adverse impact of uncertainty on import growth from beneficiary countries.

only stabilizes by the mid 2000s (Panel A of Table 6 puts this growth around 0.4 log points). Indeed, Panel A of Table 6 says we can only detect annual import growth of GSP-eligible products in 1997, 1999 and 2003 and Panel B says we can only detect 3-year rolling window import growth in 1999, 2001 and 2004. Ultimately, the dynamics of GSP-eligible products look like what we expect from 5-year or 10-year phase out products rather than immediate cut products. Indeed, this gradual import growth in GSP-eligible products is an important part of the overall pattern of gradual import growth given Columns (7)-(8) and (13)-(14) of Table 1 show GSP-eligible products represent 47.3% of products and 32.7% of imports using Mexico's staging categories.

For Canadian imports, Figure 3 presents broadly similar evidence to that in Figure 2 regarding Mexican imports. In panel (a), post-NAFTA growth of immediate cut products become statistically significant and again stabilizes around the late1990s/early 2000s. At around 0.25 log points above their pre-NAFTA 1992 level, and hence much smaller than the 0.9 log points in Figure 2 for Mexican imports, this is consistent with Table 2 showing Canadian immediate cut products experience tariff cuts one-third as large as Mexican immediate cut products. Similar to Mexican immediate cut products, Panel D of Table 6 shows we can detect 3-year rolling window import growth of 0.10-0.25 log points for immediate cut products in 1993 and each year during 1996-2000. Thus, again, immediate cut products experience the type of delayed import growth one would have expected from 5-year phase out products.

Unlike the Mexican case where the 10+ year phase out products formed the bulk of products and imports whose tariffs were actually phased in over time, Canada's staging categories imply 5-year phase out products (B and B6 products) account for 17.2% of products and 7.7% of imports compared to around 1% of products and imports for 10+ year phase out products (this directly follows from the implications of Canada's CUSFTA phase outs for their NAFTA phase outs). Indeed, Panel (b) of Figure 3 and Panel C of Table 6 show import growth from Canada's 5-year phase out products stabilize around the late 1990s/early 2000s at around 0.5 log points. This is basically double the import growth of Canada's immediate cut products and consistent with the 5-year products experiencing tariff cuts of around 5-6% points rather than the 2.6% tariff cut experienced by Candian immediate cut products. Yet, like the Mexican case, Canadian immediate cut and 5-year phase out both products stablize in the late 1990s/early 2000s. Indeed, for Canada, Panel D of Table 6 shows we first detect post-NAFTA import growth of immediate cut and 5-year phase out products in 1993 which stops for both types of products in 2000. That is, statistically speaking, immediate cut and 5-year phase out products both stop growing after 2000 which contrasts starkly with expectations based on a tariff phase out driven hypothesis for delayed import growth.

Figures 2-3 also present two robustness checks. One may be concerned that the growth of well-documented surge in Chinese imports into the US could be affecting our results. Thus, the black boxes exclude China from ROW without any impact on our results. One may also be concerned with the formation of other FTAs during our sample period, either US FTAs or FTAs involving Canada and/or Mexico. Such FTAs, especially if they adopt similar tariff schedules and staging categories could potentially impact our results. Thus, the blue dashed boxes exclude countries from ROW if they have an FTA with the US or Canada and/or Mexico. Again, our results are unaffected.

change at 10-digit level

Figures 4-5 present additional robustness checks. Unfortunately, as described in Section 3, product codes change over time either due to the WCO changing 6-digit HS codes periodically or based on annual USITC updates to 8-digit HS codes. In principle this is problematic given our empirical approach relies on matching 8-digit HS products with their NAFTA staging category. Figures 4-5 address these concerns in two ways. Noting that the grey clouds again depict our baseline results from Figures 2-3, the first approach to dealing with changing product codes is to only use product codes that remain unchanged over our sample period. The black boxes do this in Figures 4-5. The second approach to dealing with changing product codes is to concord product codes over time. To this end, we take the concordance from Pierce and Schott (2012) and extend it through the end of our sample period in 2016.

The dashed blue boxes do this in Figures 4-5. Overall, our results are unaffected. The only exception is panel (c) of Figure 5 pertaining to 10+ year phase out Canadian products. However, as we already mentioned, these only account for 1% of Canadian imports in our sample and hence are not of concern.

Finally, one may wonder about the extensive versus intensive margin in terms of import growth over time as a result of tariff phase outs. To address this issue, Figures 6-7 only use products continuously imported from Mexico or Canada, respectively, in each of the 28 years of our sample window. To the extent that systematic differences emerge, there is some evidence in Figure 6 that our baseline results in the long run are larger than that for continuously traded products. The interpretation would be that the extensive margin plays a non-trivial role, and a growing role over time, in delayed trade flow growth of FTAs.

Ultimately, our results suggest that tariff phase out can help explain the well known phenomena that trade flows only increase gradually after FTA formation.

5.2 Terms of trade effects

To the extent that tariffs are passed through to import prices, increases in the value of trade could come from increases in quantities or increases in prices. Thus, we now modify (3) by using unit values as the dependent variable and a proxy for import prices. This analysis will address the second hypothesis from BB that delayed terms of trade effects, through changes in import prices in our analysis, can explain the delayed trade flow effects of FTAs.

Figures 8-9 present the results. Overall, there is essentially no evidence of delayed terms of trade effects as there is essentially no impact on unit values. In turn, the impact on trade values seen in our earlier analysis reflects growth in the quantity of trade rather than the price of imports. The only subtle qualification is panel (a) of Figure 8. Here, there is some evidence that unit values rose due to the 7.5% tariff cut, on average, for Mexican products experiencing an immediate tariff cut to zero because of NAFTA. Nevertheless, the magnitudes of growth in trade values for these Mexican products in our earlier analysis implies that this change in unit values is not central to our analysis. And the fact that this is the only instance where we find some evidence for a terms of trade explanation for delayed trade flow effects of FTAs implies the delayed terms of trade story has virtually no empirical support.

6 Conclusion

Since the seminal work of Baier and Bergstrand (2007), the literature has known that trade flows increase gradually over time following FTA formation with the rule of thumb being that trade flows stabilize after doubling over 10 years. In their paper, Baier and Bergstrand (2007) hypothesize that these effects could naturally arise because FTAs typically phase out tariffs over time or because of delayed terms of trade effects. However, to the best of our knowledge, there is no empirical evidence attempting to investigate these hypotheses. One reason for this lack of research is that there is no readily and publicly available information of the tariff phase outs embodied in FTAs. Thus, by going to the publicly available texts of the CUSFTA and NAFTA agreement, we collect the necessary data and are the first to investigate the root causes suggested by Baier and Bergstrand (2007) for the delayed import growth following FTA formation.

Our central finding is that there is evidence to support the idea that tariff phase outs, but not delayed terms of trade effects, can help explain the delayed growth in trade flows typically observed following FTA formation. When looking at the impact of tariff phase outs on imports, we find that products whose tariffs are being phased out grow more. Thus, import growth following FTAs is, to a non-trivial degree, related to tariff cuts. Moreover, import growth takes longer to stabilize for products whose tariffs are being phased out over a longer period. And, comfortingly, the magnitude of the effects that we find, both across products within a country of different phase out duration and across countries for products with the same phase out duration, are consistent with differences in the actual country-product specific tariff cuts embodied in NAFTA. In contrast, there is essentially no evidence of delayed terms of trade effects.

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Appendix

7 Appendix

Constructing pre-CUSFTA and pre-NAFTA tariffs

While we can extract staging categories from the CUSFTA and NAFTA texts, it is extremely difficult to extract base rates from these texts. Thus, we construct pre-CUSFTA and pre-NAFTA tariffs according to the following procedure.

As a starting point for pre-CUSFTA tariffs faced by Canada, we take the 1989 U.S. MFN tariffs per John Romalis' data desribed in Feenstra et al. (2002) (hereafter "Romalis' tarif data"). This is reasonable because adjusting these 1989 U.S. MFN tariffs by a products' CUSFTA staging category nearly always equals the 1989 preferential tariff faced by Canadian imports per Romalis' tarif data. For the 0.69% of products where the difference is more than rounding error (i.e. more than .01% points), we manually check the CUSFTA text and adjust accordingly. We also manually check the CUSFTA text for products whose tariff is immediately cut to zero and their 1989 U.S. MFN tariff is missing per Romalis' tarif data. Additionally, products 2207.10.30 and 2401.30.60 have respective advalorem equivalent Canadian preferential tariffs per Romalis' tarif data of 673% and 97% (the next highest is 57.5%), so we treat these outliers and exclude them for the purpose of tariff summary statistics. Ultimately, we match 8574 products from the CUSFTA staging schedule to USITC import data and 7827 of these are not in the "Mixed" or "Missing" staging categories. Of these 7827 products, we have an imputed pre-CUSFTA tariff faced by Canada for 7785 products. Of the 42 products with missing pre-CUSFTA tariffs, 5 have specific tariffs but do not have an advalorem equivalent tariff per Romalis' tarif data and we cannot compute one based on pre-CUSFTA imports because our USITC import data begins in 1989. The remaining 37 products have "complex" base rates that cannot be transformed into an advalorem equivalent tariff with USITC import data.[10]

For Canada's pre-NAFTA tariff, we initially follow a two-step procedure. First, a product's pre-NAFTA tariff must be zero if its CUSFTA staging category is either A, D or B. Second, for products phased out over 10 years under CUSFTA with advalorem tariffs, their pre-NAFTA tariff must be half of their pre-CUSFTA tariff. For remaining products, we use the 1993 Canada preferential tariff per Romalis' tarif data. If this is not available, we compute the an advalorem equivalent tariff using the CUSFTA base rate, CUSFTA staging category and the last available pre-NAFTA import level from the USITC. Ultimately, we match 8843 products from the NAFTA staging schedule to USITC import data and 8023 of these are not in the "Mixed" or "Missing" staging categories for Canada. Of these 8023 products, we have an imputed pre-NAFTA tariff faced by Canada for 7982 products. Of the 41 products with missing pre-NAFTA tariffs, 5 have complex tariff structures and 2 are specific tariffs but we cannot compute an advalorem equivalent because they were not not imported from Canada before NAFTA per our USITC import data. A further 29 NAFTA products were not in CUSFTA and their tariff is missing per Romalis' tarif data. The final 5 products were part of a CUSFTA "mixed" product and hence we do not know its CUSFTA base rate and, in turn, cannot compute its pre-NAFTA tariff.

For Mexico's pre-NAFTA tariff, the process is much simpler. For Mexico's pre-NAFTA GSP eligible products and for NAFTA staging category D products, the pre-NAFTA tariff is zero. For other products, we first check the U.S. 1993 MFN advalorem equivalent tariff per Romalis' tarif data. For remaining products, we self-compute an advalorem equivalent tariff using the NAFTA base rate and the last available pre-NAFTA import level from the

[10]For example, the base rate for product 2613.90.00, which is *other molybdenum ore and concentrate*, depends on the amount of molybdenum content.

USITC. Of the 8876 Mexican products that we can match from the NAFTA schedule or GSP eligibility to USITC import data, 8251 are not in the "Mixed" or "Missing" staging categories. Of these 8251 products, we have pre-NAFTA tariffs for 8228. Of the remaining 23 products, 19 have complex tariff structures and 4 have specific MFN tariffs but we cannot self-compute an advalorem equivalent tariff because the product was not imported from Mexico before NAFTA per our USITC import data.

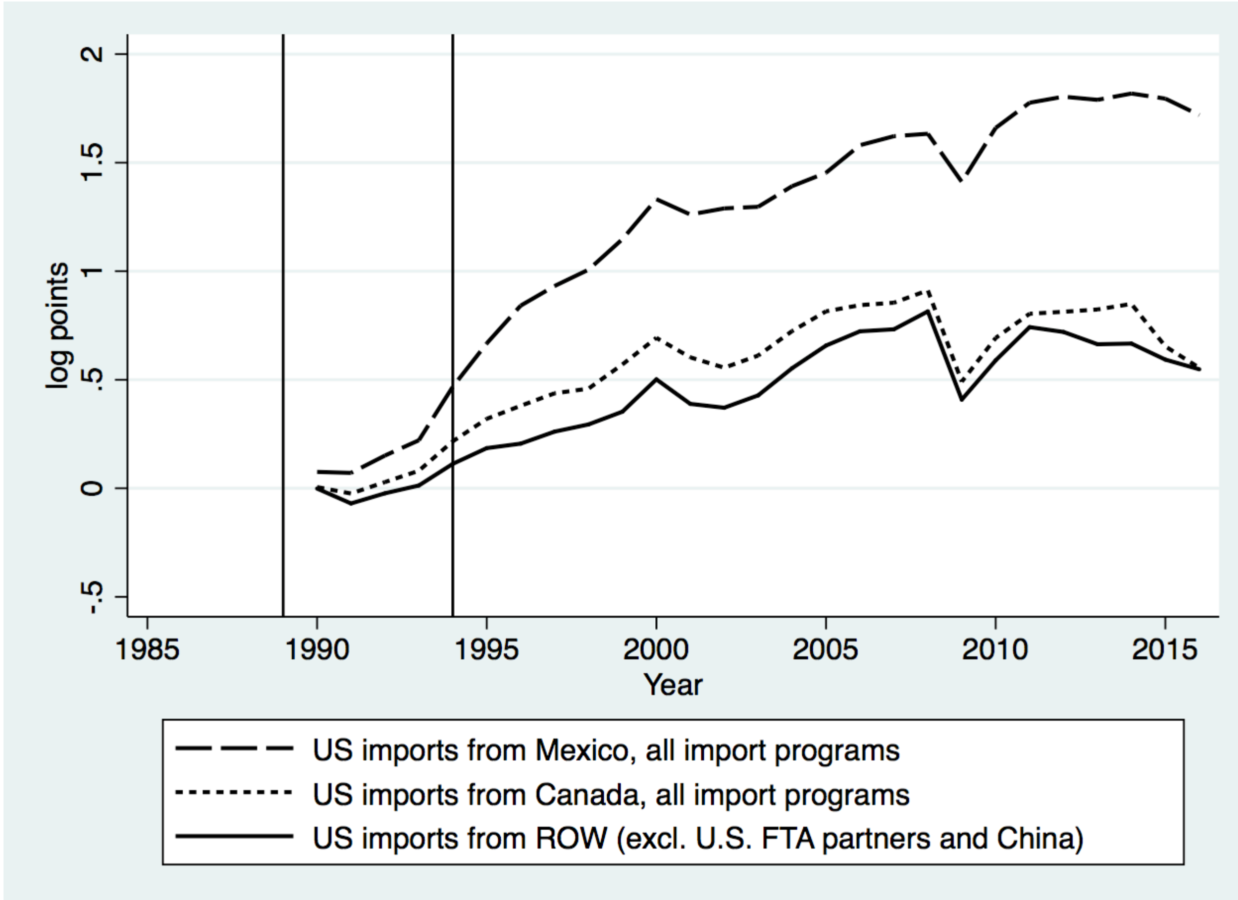
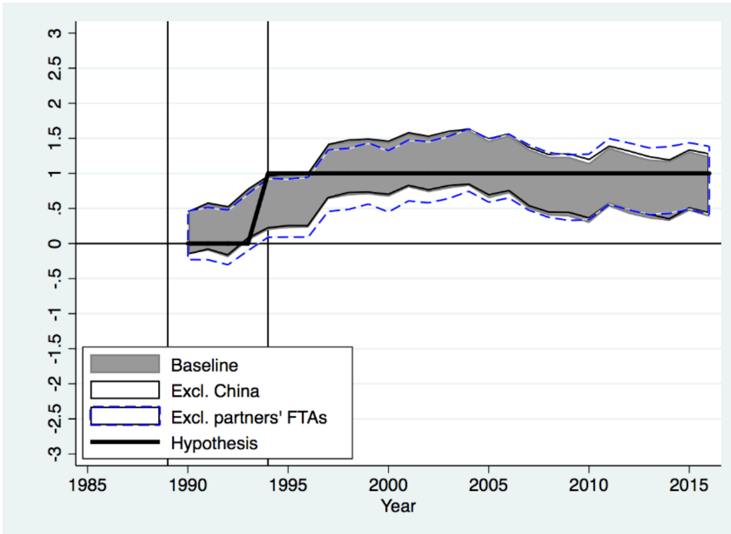
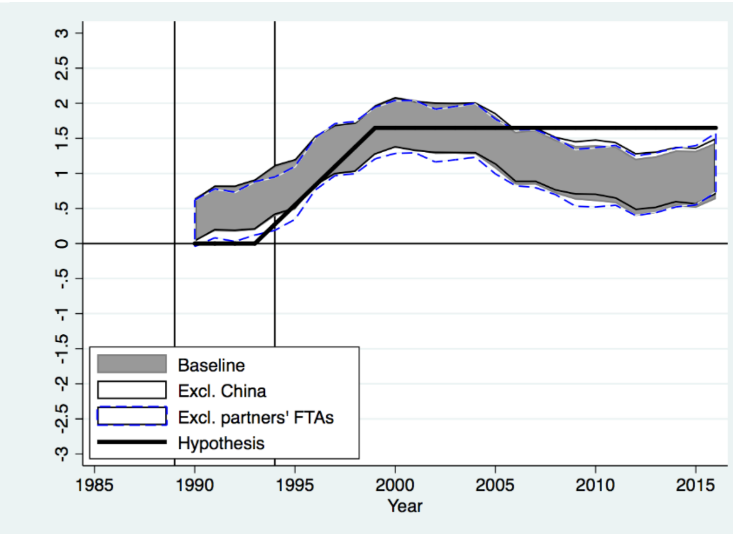


Figure 1. Cumulative import growth 1989-2016

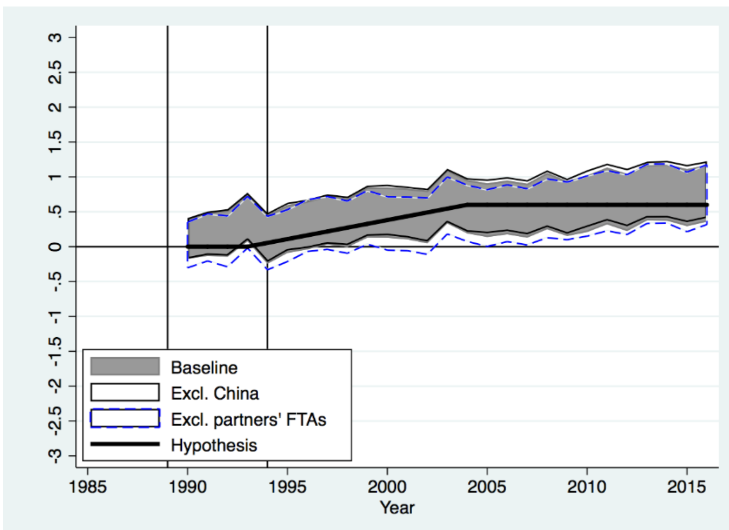
Notes: Import data is imports for consumption from USITC, aggregated from bilateral HS10 level. The figure depicts cumulative import growth relative to 1989.



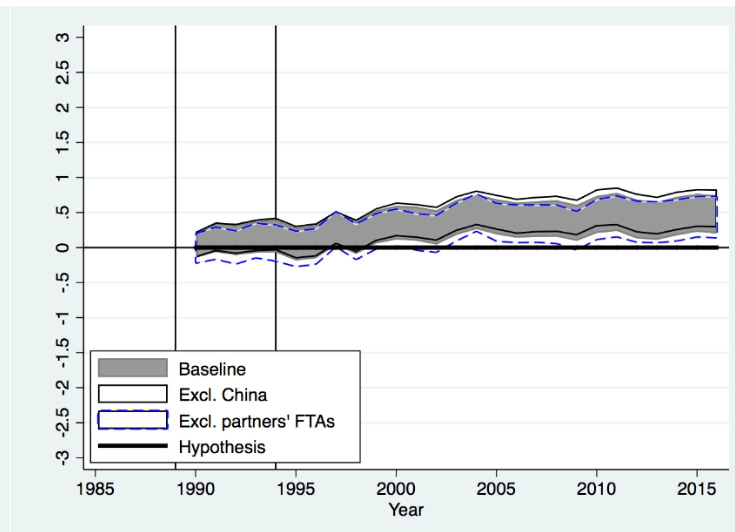
(a) Immediate cut (A)



(b) 5 year phase out (B, B6)



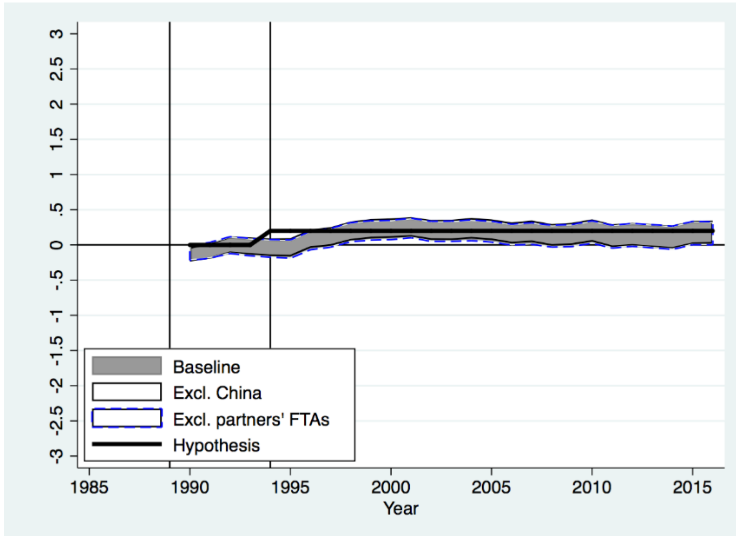
(c) 10+ year phase out (C, C10, C+)



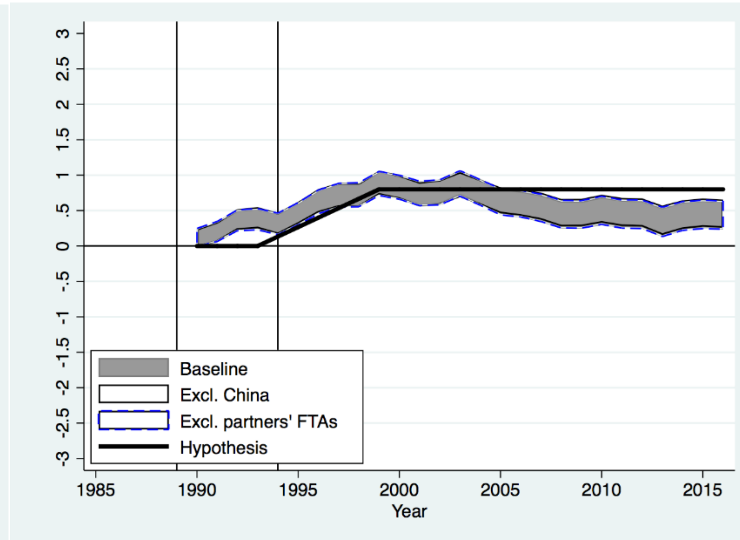
(d) GSP

Figure 2. Mexico time varying DDD estimates

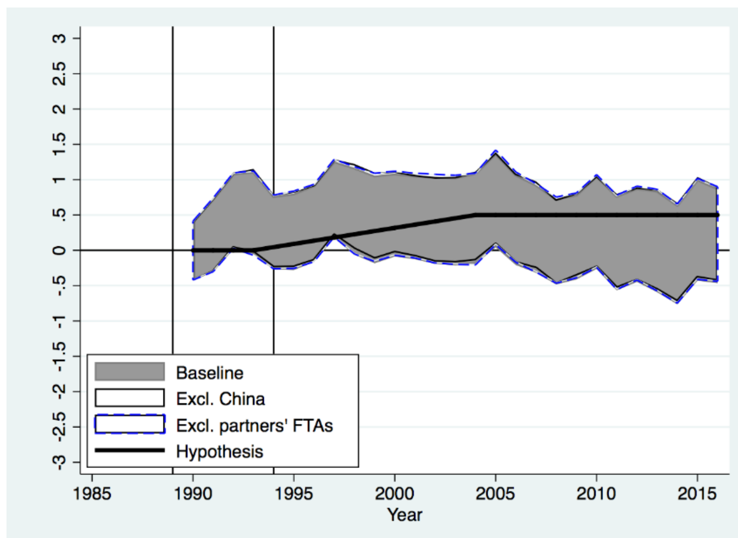
Notes: DDD point estimates correspond to equation (3) in the main text. Grey clouds represent 95% confidence intervals. Two-way clustered standard errors are used, clustering on both country-year and product-year.



(a) Immediate cut (A)



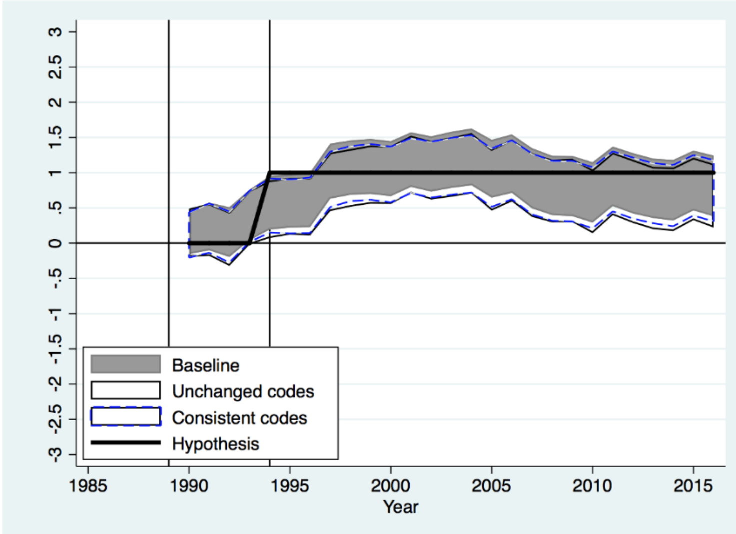
(b) 5 year phase out (B & B6)



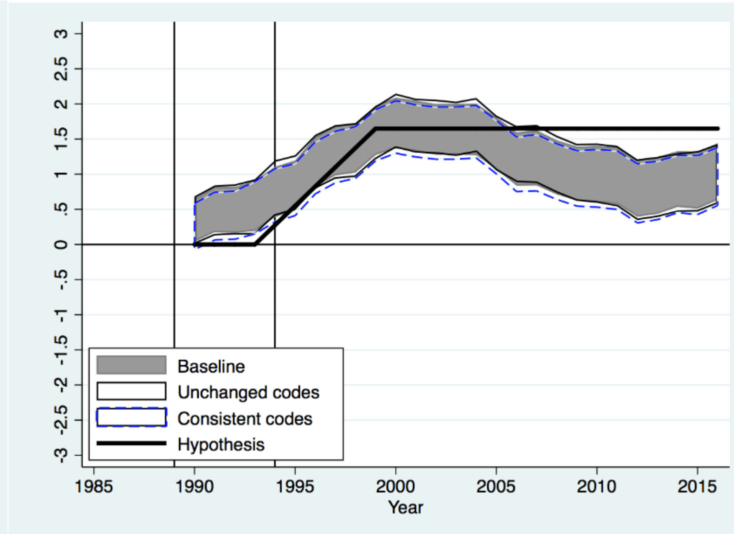
(c) 10+ year phase out (C, C10, C+)

Figure 3. Canada time-varying DDD estimates

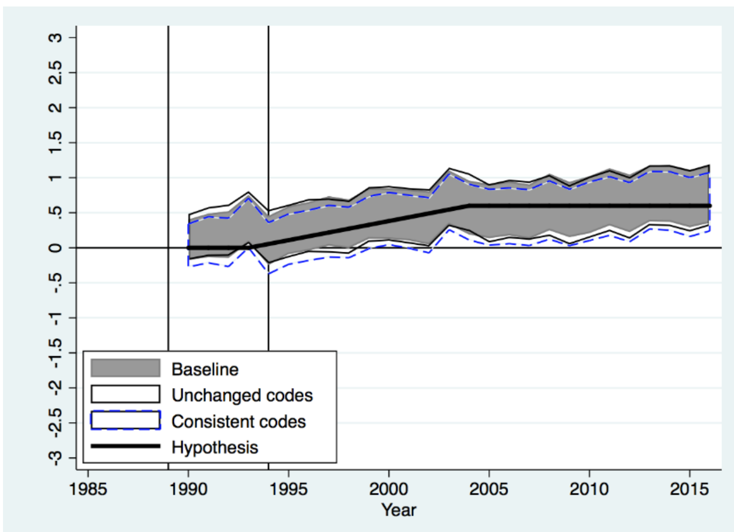
Notes: DDD point estimates correspond to equation (3) in the main text. Grey clouds represent 95% confidence intervals. Two-way clustered standard errors are used, clustering on both country-year and product-year.



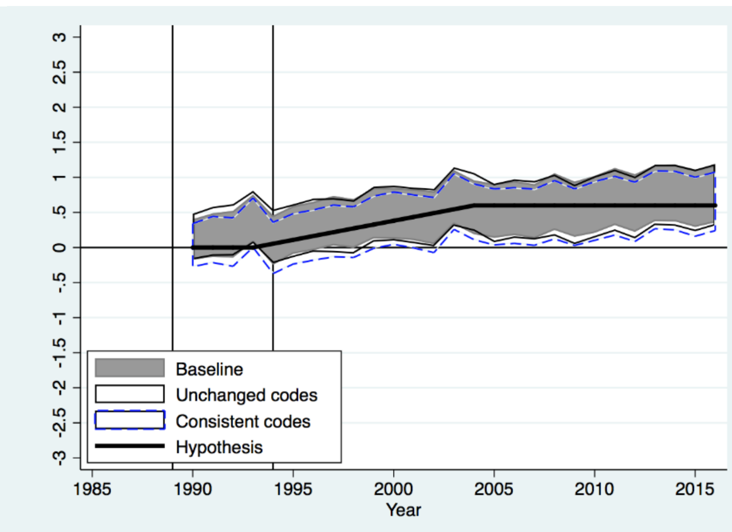
(a) Immediate cut (A)



(b) 5 year phase out (B, B6)



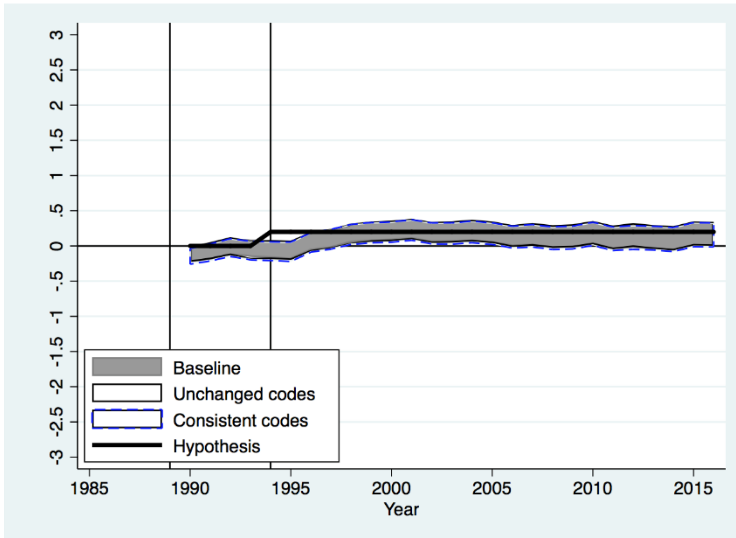
(c) 10+ year phase out (C, C10, C+)



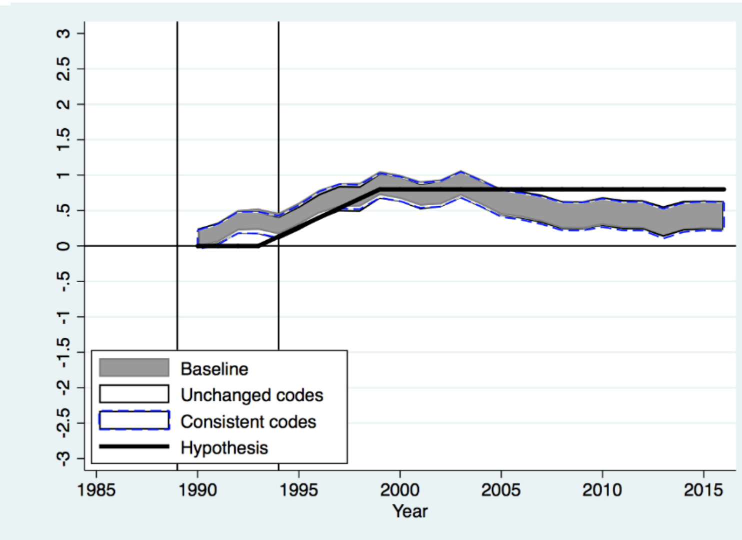
(d) GSP

Figure 4. Mexico time varying DDD estimates: robustness

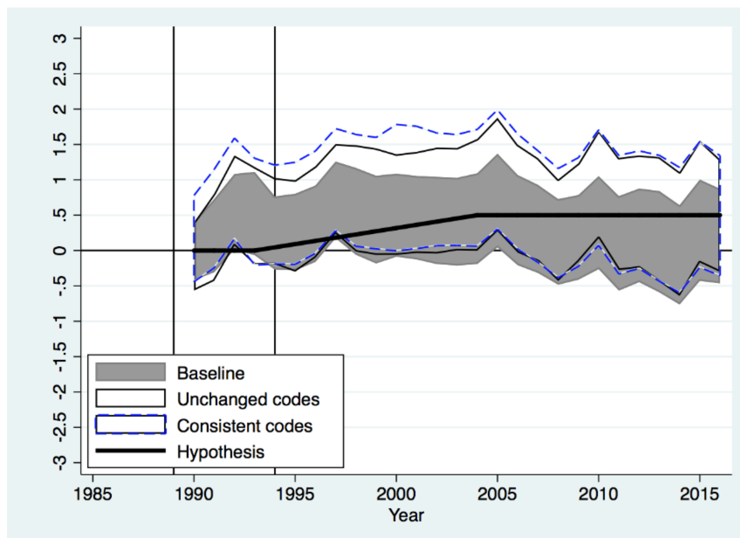
Notes: DDD point estimates correspond to equation (3) in the main text. Grey clouds represent 95% confidence intervals. Two-way clustered standard errors are used, clustering on both country-year and product-year. See main text for further details.



(a) Immediate cut (A)



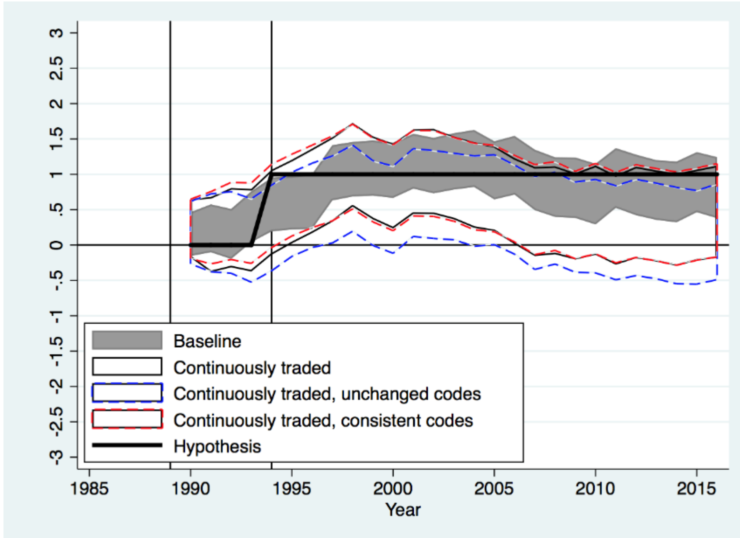
(b) 5 year phase out (B & B6)



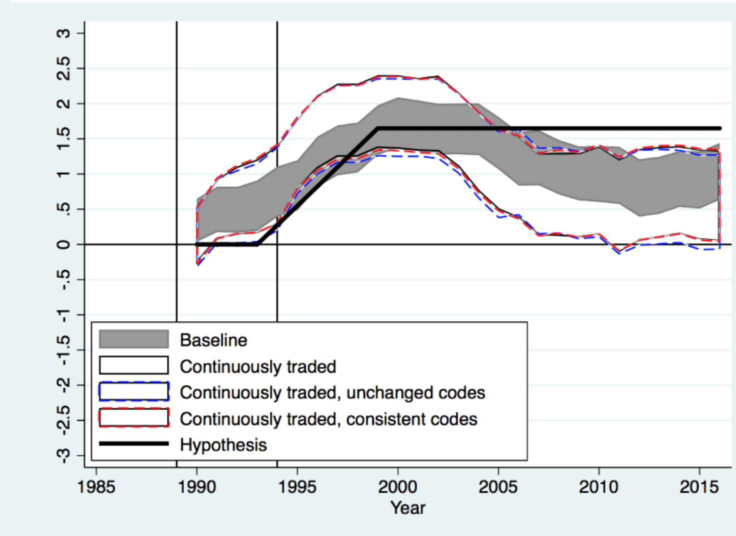
(c) 10+ year phase out (C, C10, C+)

Figure 5. Canada time-varying DDD estimates: robustness

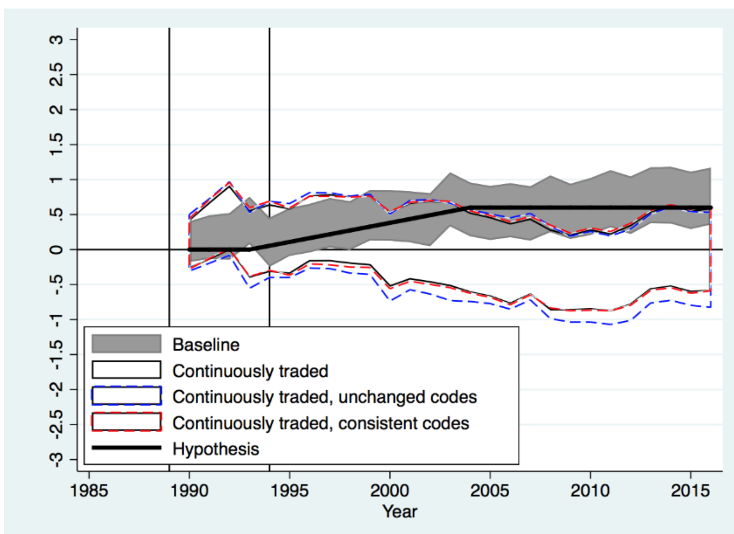
Notes: DDD point estimates correspond to equation (3) in the main text. Grey clouds represent 95% confidence intervals. Two-way clustered standard errors are used, clustering on both country-year and product-year. See main text for further details.



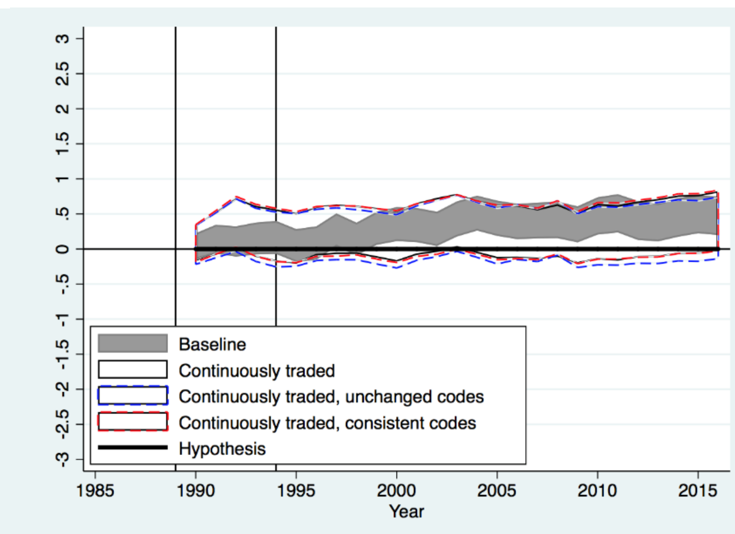
(a) Immediate cut (A)



(b) 5 year phase out (B, B6)



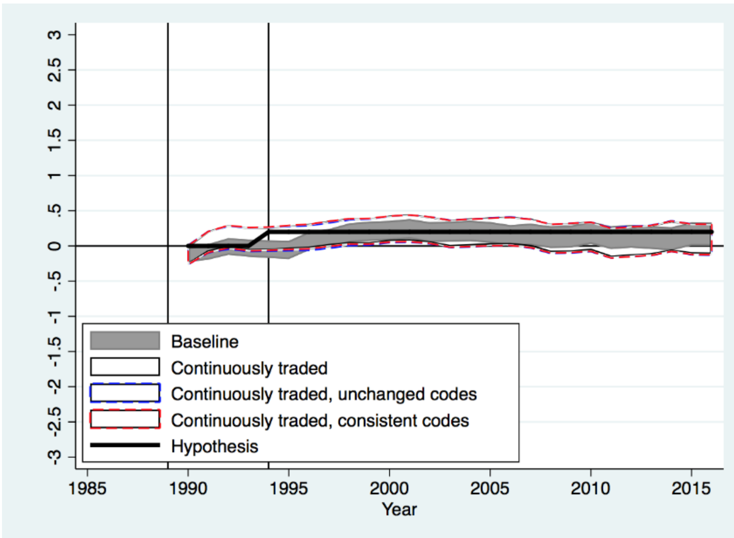
(c) 10+ year phase out (C, C10, C+)



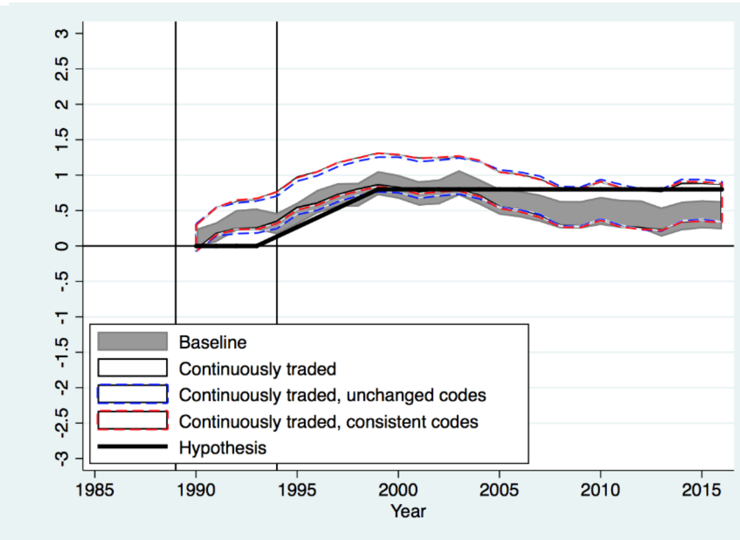
(d) GSP

Figure 6. Mexico time varying DDD estimates: continuously traded products

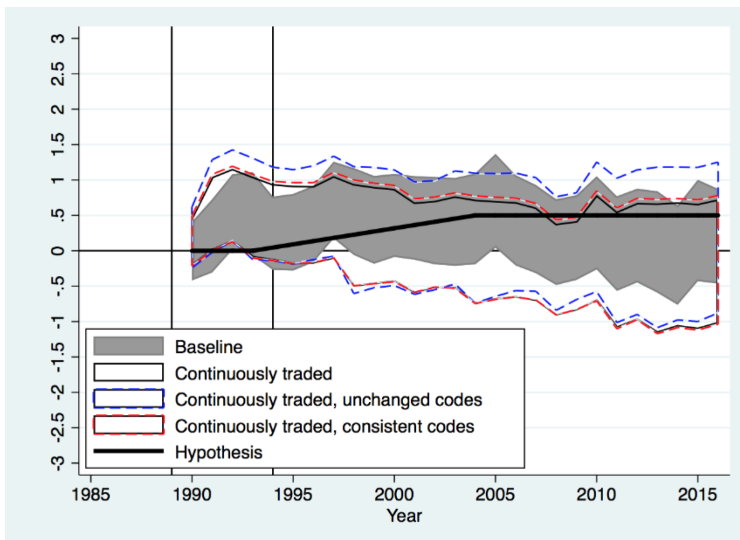
Notes: DDD point estimates correspond to equation (3) in the main text. Grey clouds represent 95% confidence intervals. Two-way clustered standard errors are used, clustering on both country-year and product-year. See main text for further details.



(a) Immediate cut (A)



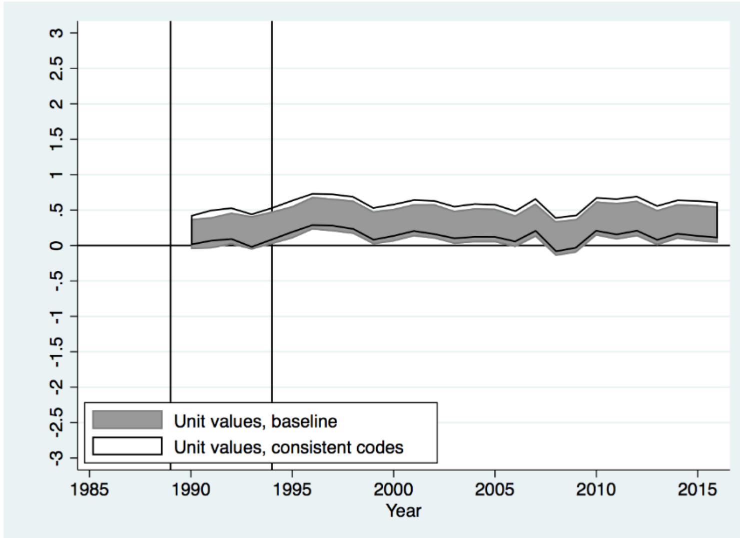
(b) 5 year phase out (B & B6)

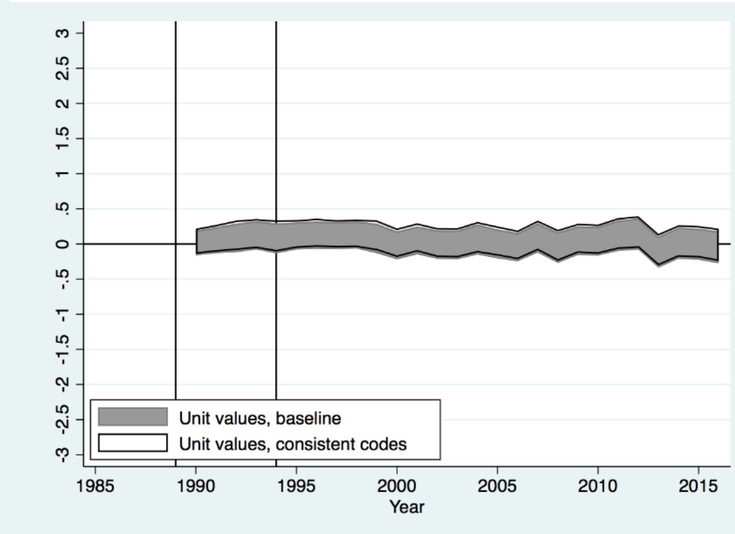


(c) 10+ year phase out (C, C10, C+)

Figure 7. Canada time-varying DDD estimates: continuously traded products

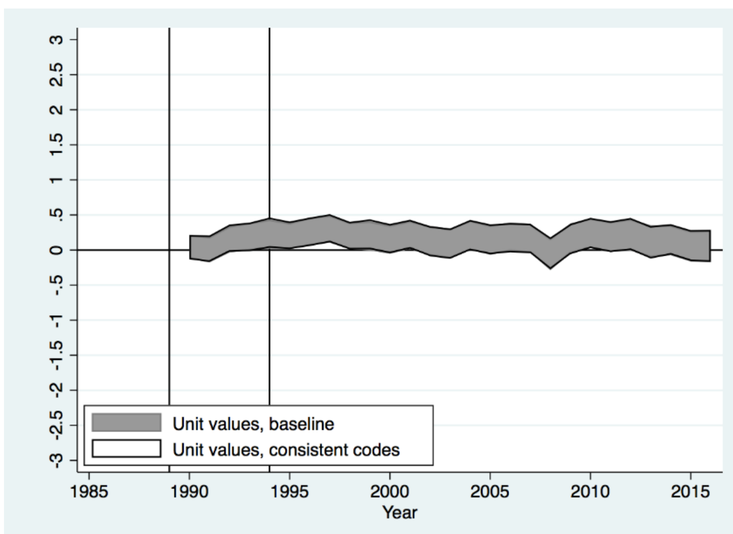
Notes: DDD point estimates correspond to equation (3) in the main text. Grey clouds represent 95% confidence intervals. Two-way clustered standard errors are used, clustering on both country-year and product-year. See main text for further details.

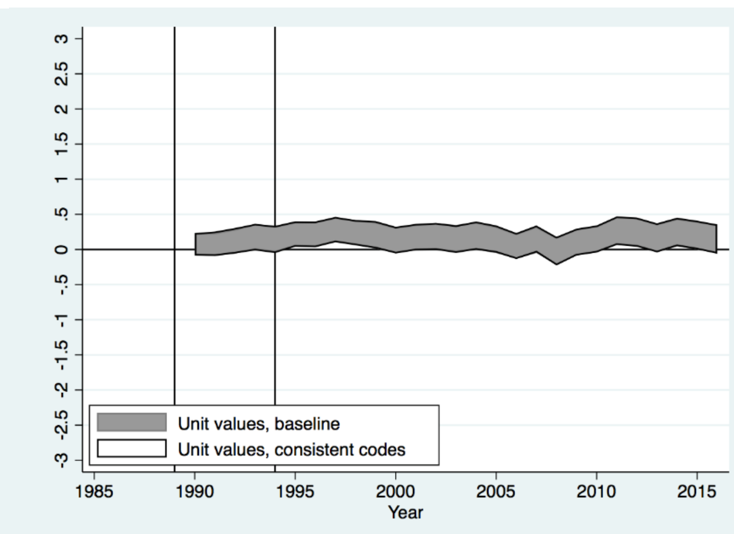




(a) Immediate cut (A)

(b) 5 year phase out (B, B6)



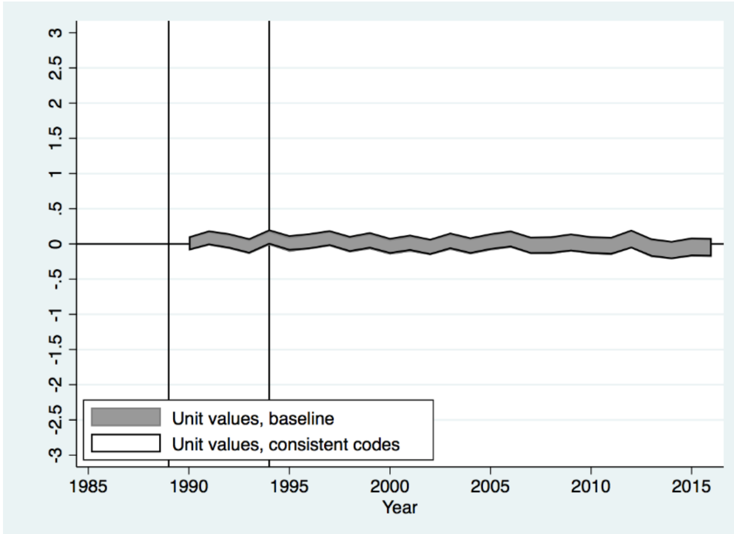


(c) 10+ year phase out (C, C10, C+)

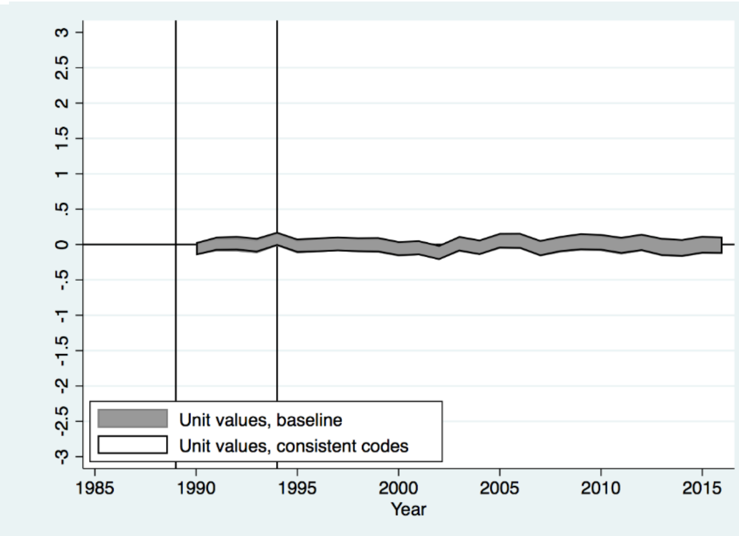
(d) GSP

Figure 8. Mexico time varying DDD estimates: unit values

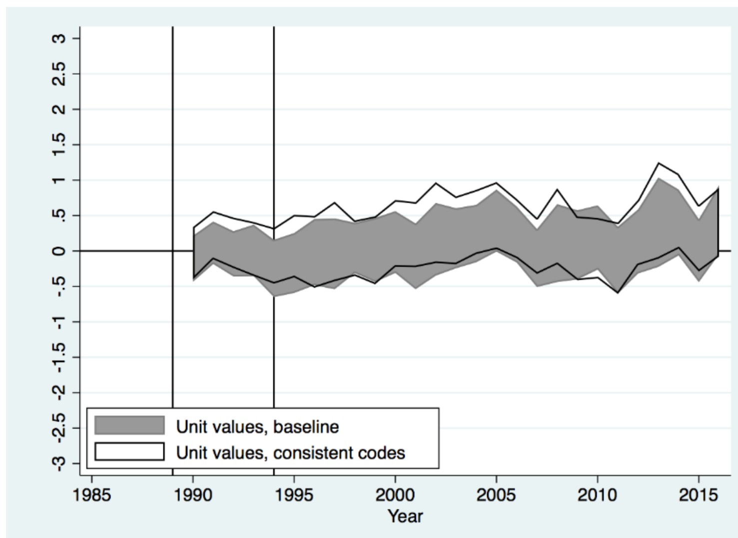
Notes: DDD point estimates correspond to equation (3) in the main text except with unit values as the dependent variable. Grey clouds represent 95% confidence intervals. Two-way clustered standard errors are used, clustering on both country-year and product-year. See main text for further details.



(a) Immediate cut (A)



(b) 5 year phase out (B & B6)



(c) 10+ year phase out (C, C10, C+)

Figure 9. Canada time-varying DDD estimates: unit values

Notes: DDD point estimates correspond to equation (3) in the main text except with unit values as the dependent variable. Grey clouds represent 95% confidence intervals. Two-way clustered standard errors are used, clustering on both country-year and product-year. See main text for further details.

Table 1. NAFTA and CUSFTA tariff schedule staging categories

		Panel A		Panel B						Panel C					
		CUSFTA: product level data		NAFTA: distribution of products						NAFTA: distribution of import value ($tn)					
Staging Category				NAFTA		Canada		Mexico		NAFTA		Canada		Mexico	
Code	Description	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
A	Immediate cut to 0	315	3.7%	4,526	51.2%	2,535	28.7%	981	11.1%	$9.81	41.4%	$4.40	18.6%	$4.29	18.1%
B	5 equal annual cuts to 0	2,285	26.7%	179	2.0%	792	9.0%	169	1.9%	$0.18	0.8%	$1.18	5.0%	$0.13	0.6%
B6	1 immediate cut + 5 equal annual cuts to 0			728	8.2%	728	8.2%	726	8.2%	$0.65	2.7%	$0.65	2.7%	$0.64	2.7%
C	10 equal annual cuts to 0	3,932	45.9%	750	8.5%	94	1.1%	737	8.3%	$4.14	17.5%	$0.24	1.0%	$4.09	17.3%
C10	Non-linear cuts to zero over 10 years			71	0.8%	0	0.0%	71	0.8%	$0.28	1.2%		0.0%	$0.28	1.2%
C+	15 equal annual cuts to 0			74	0.8%	3	0.0%	72	0.8%	$0.11	0.5%	$0.00	0.0%	$0.11	0.4%
D	Continue duty free	1,295	15.1%	1,329	15.0%	3,871	43.8%	1,301	14.7%	$4.99	21.1%	$14.37	60.6%	$4.97	21.0%
GSP								4,192	47.2%					$7.75	32.7%
Mixed		745	8.7%	1,118	12.6%	753	8.5%	559	6.3%	$3.42	14.4%	$2.76	11.6%	$1.33	5.6%
Missing		2	0.0%	66	0.7%	65	0.7%	66	0.7%	$0.12	0.5%	$0.11	0.5%	$0.12	0.5%
Total		8,574	100%	8,841	100%	8,841	100%	8,874	100%	$23.70	100%	$23.70	100%	$23.71	100%

Notes: Staging category data comes from CUSFTA Article 401 and Annex 401.2 and NAFTA Annex 302.2. Panels A and B describe the distribution of products in these Annexes across staging categories. Columns (5)-(6) modify the NAFTA staging categories for consistency with CUSFTA staging categories. Columns (7)-(8) modify the NAFTA staging categories for consistency with Mexico's product-level elibibility for the US Generalized System of Preferences (GSP) program. Panel C merges the NAFTA staging category data with 8-digit HS USITC import data at the exporter-product level, including NAFTA and non-NAFTA exporters, for the period 1989-2016. Panels A and B only use products that appear in this USITC import data. Imports are measured in trillions of real 2010 USD using the World Development Indicator GDP deflator. See main text and Table 2 for further details.

Table 2. Tariff cuts by staging categories

		CUSFTA tariff cuts on Canada			NAFTA tariff cuts on Canada			NAFTA tariff cuts on Mexico		
Code	Description	Products	Pre-CUSFTA mean tariff	Mean annual tariff cut	Products	Pre-NAFTA mean tariff	Mean annual tariff cut	Products	Pre-NAFTA mean tariff	Mean annual tariff cut
A	Immediate cut to 0	312	0.036	0.036	2,508	0.026	0.026	960	0.075	0.075
B	5 equal annual cuts to 0	2,284	0.058	0.012	791	0.047	0.009	168	0.094	0.019
B6	1 immediate cut + 5 equal annual cuts to 0				727	0.063	0.011	723	0.127	0.021
C	10 equal annual cuts to 0	3,894	0.085	0.009	85	0.015	0.002	734	0.076	0.008
C10	Non-linear cuts to zero over 10 years							71	0.141	0.014
C+	15 equal annual cuts to 0							72	0.198	0.013
D	Continue duty free	1,295	N/A	N/A	3,871	N/A	N/A	1301	N/A	N/A
GSP								4159	N/A	N/A
Mixed		745	N/A	N/A	753	N/A	N/A	559	N/A	N/A
Missing		2	N/A	N/A	65	N/A	N/A	66	N/A	N/A
Total		8,532			8,800			8,813		

Table 3. Matching NAFTA tariff schedule to USITC trade data

	Product level data			Exporter-product level data					
	Panel A			Panel B: Products			Panel C: Import values ($tn)		
Year	Trade	Stagings	Match %	Trade	Stagings	Match %	Trade	Stagings	Match %
1989	8,602	8,393	97.57%	131,048	127,390	97.21%	$0.44	$0.43	97.11%
1990	8,677	8,454	97.43%	126,447	122,935	97.22%	$0.47	$0.45	97.19%
1991	8,659	8,521	98.41%	125,963	123,662	98.17%	$0.46	$0.45	97.66%
1992	8,745	8,640	98.80%	129,326	127,554	98.63%	$0.50	$0.49	98.01%
1993	8,690	8,673	99.80%	134,926	134,498	99.68%	$0.53	$0.53	98.75%
1994	8,994	8,490	94.40%	145,319	136,277	93.78%	$0.62	$0.53	85.61%
1995	9,568	7,911	82.68%	151,752	129,641	85.43%	$0.69	$0.55	78.68%
1996	9,770	7,449	76.24%	158,050	125,800	79.60%	$0.74	$0.54	72.37%
1997	9,997	7,461	74.63%	168,033	130,389	77.60%	$0.80	$0.57	71.34%
1998	9,896	7,392	74.70%	168,495	130,903	77.69%	$0.85	$0.59	70.18%
1999	9,876	7,406	74.99%	170,030	132,860	78.14%	$0.94	$0.65	69.72%
2000	9,908	7,412	74.81%	178,080	138,807	77.95%	$1.11	$0.78	70.41%
2001	9,917	7,406	74.68%	178,476	138,543	77.63%	$1.03	$0.76	73.47%
2002	10,163	6,955	68.43%	185,114	134,846	72.84%	$1.05	$0.71	67.79%
2003	10,179	6,953	68.31%	188,279	136,934	72.73%	$1.13	$0.77	67.91%
2004	10,155	6,950	68.44%	191,986	139,445	72.63%	$1.33	$0.90	67.44%
2005	10,172	6,944	68.27%	195,741	141,474	72.28%	$1.52	$1.03	67.60%
2006	10,188	6,951	68.23%	198,368	142,945	72.06%	$1.69	$1.14	67.83%
2007	10,116	6,343	62.70%	197,675	133,373	67.47%	$1.78	$1.15	64.51%
2008	10,095	6,339	62.79%	192,709	130,455	67.70%	$1.92	$1.26	65.64%
2009	10,043	6,326	62.99%	183,535	124,129	67.63%	$1.40	$0.87	62.17%
2010	10,053	6,326	62.93%	189,482	128,011	67.56%	$1.71	$1.09	63.31%
2011	10,098	6,333	62.72%	194,088	131,505	67.76%	$1.99	$1.27	63.89%
2012	10,300	6,093	59.16%	197,081	128,289	65.09%	$2.04	$1.28	62.96%
2013	10,287	6,091	59.21%	193,084	126,253	65.39%	$2.02	$1.27	62.87%
2014	10,299	6,087	59.10%	196,866	128,667	65.36%	$2.08	$1.30	62.30%
2015	10,308	6,096	59.14%	203,138	132,535	65.24%	$1.97	$1.21	61.35%
2016	10,297	6,099	59.23%	204,767	133,760	65.32%	$1.87	$1.15	61.57%

Notes: Staging category data refer to NAFTA US tariff schedule data from NAFTA Annex 302.2. Trade data is 8-digit USITC import data. Panel C aggregates 8-digit exporter-product US imports to the 8-digit level. Imports are measured in trillions of real 2010 USD using the World Development Indicator GDP deflator. See main text for further details.

Table 4: Time-invariant DDD estimates of NAFTA

A. Phase out products

	Mexico				Canada		
	Pre-NAFTA	Post-NAFTA	Growth		Pre-NAFTA	Post-NAFTA	Growth
NAFTA partner	12.5068	12.8515	0.3447	NAFTA partner	12.3348	12.6698	0.3350
	(0.0249)	(0.0111)	(0.0296)		(0.0249)	(0.0125)	(0.0309)
	[12,690]	[79,918]			[11,612]	[61,642]	
ROW	11.6033	11.3592	-0.2442	ROW	11.3891	11.0909	-0.2982
	(0.0046)	(0.0019)	(0.0053)		(0.0046)	(0.0019)	(0.0068)
	[320,382]	[2,094,494]			[195,882]	[1,380,218]	
Difference-in-difference			0.5889	Difference-in-difference			0.6332
			(0.0273)				(0.0293)

B. CDF products

	Mexico				Canada		
	Pre-NAFTA	Post-NAFTA	Growth		Pre-NAFTA	Post-NAFTA	Growth
NAFTA partner	12.45611	12.87018	0.41407	NAFTA partner	13.1335	13.5496	0.4161
	(0.0583)	(0.0259)	(0.0296)		(0.0282)	(0.0136)	(0.0326)
	[2,281]	[13,524]			[11,612]	[61,642]	
ROW	11.83941	11.92758	0.08817	ROW	11.8891	11.8719	-0.0172
	(0.0113)	(0.0048)	(0.0130)		(0.0066)	(0.0028)	(0.0075)
	[52,487]	[338,494]			[151,147]	[904,627]	
Difference-in-difference			0.3259	Difference-in-difference			0.4333
			(.0641)				(0.0295)
DDD			0.2630	DDD			0.1999
			(0.0702)				(0.0418)

Notes: Cells contain mean log imports for the relevant group of countries, products and years. Phase out products, CDF products, Pre-NAFTA and Post-NAFTA years are defined in the text. Standard errors in parentheses. Number of observations in square brackets. The triple difference estimate is the difference between the difference-in-difference estimate in Panel A less that in Panel B.

Table 5: Time-invariant regression DDD estimates of NAFTA

	Mexico		Canada	
	(1)	(2)	(3)	(4)
Post	0.0882		-0.0172	
	(.0295)		(.0157)	
NAFTA	0.6167		-1.2444	
	(.0994)		(.0510)	
Phase	-0.2361		-0.5000	
	(.0313)		(.0209)	
Post x NAFTA	0.3259		0.4333	
	(.810)		(.0372)	
Post x Phase	-0.3323		-0.2810	
	(.0313)		(.0210)	
NAFTA x Phase	0.2868		-0.2987	
	(.1080)		(.0682)	
Post x NAFTA x Phase	0.2630	0.3715	0.1999	0.2604
	(.0890)	(.0743)	(.0510)	(.0391)
N	2,914,270	2,816,958	2,769,023	2,678,207
Country x Year FE	No	Yes	No	Yes
Country x Product FE	No	Yes	No	Yes
Product x Year FE	No	Yes	No	Yes

Notes: Columns (1) and (3) based on equation (2) from main text. Columns (2) and (4) based on equation (3) from main text. Two-way clustered standard errors are used, clustering on both country-year and product-year.