Consequences of Trade Uncertainty: The Unintended Impact of NAFTA Renegotiations on Foreign Direct Investment in Mexico*

Danielle Parks

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Abstract

Numerous researchers document how trade agreements lower prices for consumers and provide export opportunities for producers leading to investment flows, economic growth, productivity improvements, and poverty reduction. As trade agreements become outdated, renegotiating agreements will likely become more common.

This paper is one of the first to quantify the unintended consequences of the trade uncertainty induced by President Trump renegotiating NAFTA in 2017 on Mexico's net inflow of foreign direct investment. The data consists of a panel of 92 industries across 32 states from 2009 to 2019. This paper exploits the variation in industry and state exposure to NAFTA renegotiations using three estimation strategies: difference-in-differences, triple difference, and Poisson Pseudo Maximum Likelihood estimates.

The threat of reverting back to MFN tariffs leads to a reduction in FDI net inflows. A one percent increase in tariffs is associated with a decrease in FDI by $2.5 million USD for industries that are the sole exporter of their state. Using a Poisson Pseudo Maximum Likelihood estimator, the US-China Trade War accounts for an increase in FDI by 24 percent while the NAFTA renegotiations decreased FDI by 3 percent. Future research is necessary to disentangle the impacts of NAFTA renegotiations on vertical and horizontal FDI net inflows.

From a policy perspective, the decrease in investment behavior suggests that potential policy solutions include incorporating clauses against immediate trade agreement termination and overtime incrementally increasing tariffs if the agreement is adjusted or abolished. Both suggestions limit the extent of the uncertainty shock.

*Parks: Department of Economics, University of Colorado, Boulder.

1 Introduction

Regional trade agreements (RTAs) reduce the barriers to international trade by eliminating tariffs, establishing common practices, encouraging investment, and protecting intellectual property. Over the past few decades, countries have increasingly relied on trade agreements to strengthen international trade and investment flows (Figure 1). To date, there are 369 active regional free trade agreement worldwide. Of those agreements, the United States has 14 RTAs with 20 countries.

Trade agreements are signed without an expiration or renegotiation date. As the international economy and technology evolves, countries may choose to revisit old agreements. In 1994 when the North American Free Trade Agreement (NAFTA) went into force, there were 37 active and 47 inactive agreements. The inactive RTAs were either replaced with new trade agreements or abolished. The United States had one inactive agreement, the Canada - United States Free Trade Agreement (CUSFTA), which was active for five years and replaced by NAFTA. This remained the only inactive agreement for the United States in 2017 when NAFTA renegotiations started. However, worldwide it is becoming increasingly more common to replace or eliminate RTAs. There are currently 193 inactive RTAs that were enforced for an average of eight years.

The existing trade literature documents how trade agreements lower prices for consumers and provide export opportunities for producers leading to investment flows, economic growth, productivity improvements, and poverty reduction. The greatest gains from RTAs occur when the trade-policy environment is experiencing uncertainty (Limão and Maggi 2015). However, the firms that are the least sensitive to trade uncertainty shocks are those that are highly integrated exporters (Carballo 2018).

Previous literature details the benefits of trade agreements; however, research is limited on how renegotiating agreements affect trade and investment uncertainty. As RTAs become outdated, renegotiating agreements will likely become more common and understanding the effects on investment decisions has important policy implications. This paper is one of the first to quantify the unintended consequence of the trade

uncertainty induced by President Trump renegotiating NAFTA in 2017 on Mexico's net inflow of foreign direct investment. From a policy perspective, estimating the extent of the change in investment behavior is essential for creating strategies to mitigate the increased risks associated with future trade agreement renegotiation.

The data consists of a panel of 92 industries across 32 states from 2009 to 2019. Using a difference-in-differences model, the paper exploits the variation in industry and state exposure to NAFTA renegotiations. The treatment variable is the predicted tariff change, which is the difference between the Most Favored Nations (MFN) tariff and NAFTA tariff weighted by the share of an industry's exports in 2016 by state. This paper assumes that Mexico's top exporting industries are more exposed to NAFTA induced uncertainty than non-exporting industries. In 2016, Mexico's top exports to the United States include machines (40 percent), transportation (26 percent), and instruments (5 percent). Conversely, industries such as social assistance and health care residential facilities, which do not export to the United States are less impacted by NAFTA uncertainty. This paper also assumes that Mexican states along the Texas-Mexico border are more exposed to NAFTA induced uncertainty than states in the southern region of Mexico due to lower transportation costs.

The change in FDI net inflow could be due to vertical FDI or horizontal FDI. Vertical FDI involves a foreign corporation investing in a different stage of the production process, whereas horizontal FDI occurs when a foreign corporation establishes the same type of business operation as in the home country. To isolate the type of FDI net inflow, this paper uses a triple differences estimate with three different group identifiers. To measure the effect of vertical FDI, the group identifiers are border or maquila.[1] Border is an indicator variable if the state is located along the Mexico-Texas border.[2] Maquila is an indicator variable if the state and industry had at least one maquila.

[1] A maquila is a foreign-owned manufacturing facility that utilizes Mexico's relatively low labor costs to assemble products. The finished products are then sent back to the country of origin. A maquila has the advantage of operating duty and tariff free. These factories are typically in border states with the United States.

[2] Border states include Chihuahua, Baja California, Sonora, Coahuila de Zaragoza, Tamaulipas, and Nuevo Leon.

Conversely, horizontal FDI is attracted by high production volumes. Thus, the group identifier is top producer, which is the top 70th decile of total gross production by state and industry.

This paper finds that a threat of reverting back to MFN tariffs leads to a reduction in FDI net inflows. Controlling for the US-China Trade War, a threat of a one percent increase in tariffs is associated with a decrease in FDI by $2.5 million USD for industries that are the sole exporter of their state. Using a Poisson Pseudo Maximum Likelihood estimator, the US-China Trade War accounts for an increase in FDI by 24 percent while the NAFTA renegotiations decreased FDI by 3 percent. Future research is necessary to disentangle the impacts of NAFTA renegotiations on vertical and horizontal FDI net inflows.

From a policy perspective, the decrease in investment behavior suggests that potential policy solutions include incorporating clauses against immediate trade agreement termination and overtime incrementally increasing tariffs if the agreement is adjusted or abolished. Both suggestions limit the extent of the uncertainty shock.

2 Background

NAFTA negotiations began in 1991, and NAFTA went into force on January 1, 1994. NAFTA was the first Free Trade Agreement (FTA) signed between developed countries and a developing country. The agreement progressively eliminated tariffs and duties between the United States, Mexico, and Canada. It also included chapters covering rules of origin, customs procedures, investment, trade in services, protection of intellectual property rights, and dispute settlement procedures.

In September of 2016, future United States President Donald Trump denounced NAFTA during the first presidential debate claiming it was the "worst trade deal maybe ever signed anywhere, but certainly ever signed in this country." [3] He was inaugurated in January 2017. NAFTA renegotiations began four months later (see Figure

[3] https://money.cnn.com/2016/09/27/news/economy/donald-trump-nafta-hillary-clinton-debate/

2). Negotiations included new tariffs and more restrictive rules of origin, particularly for the automotive sector. Over the course of negotiations, President Trump threatened to withdraw from NAFTA in December of 2018, which would be effective within six months. Although the United States never formally withdrew, it sparked uncertainty in the future of investments and trade. Negotiations continued through eight rounds of formal talks over the course of three years. It was ratified and renamed the United States-Mexico-Canada Agreement (USMCA). It entered into force in July of 2020. It is difficult to determine any effects after the new deal was enforced due to the COVID pandemic, which was declared in March of 2020.

Throughout the period of uncertainty (2017 to 2019), President Trump also initiated the US-China Trade War in early 2018, which is a primary concern for identification. The Trade War progressively and drastically increased tariffs for the United States and China [4]. It resulted in Mexico becoming the United States' top trade partner rather than China. Due to the proximity concentration trade-off, there is an incentive to reallocate production from China to Mexico to avoid paying the higher tariffs. Neglecting the Trade War would result in an omitted variable bias. As such, all empirical specifications control for the Trade War at the state, industry, and year level (see Empirical Specification).

3 Existing Literature

The current literature primarily uses calibrated models to determine the impact of existing trade policies on welfare and the potential consequences of counterfactual experiments. These models predict that out of the three trade partners, Mexico benefited the most from NAFTA. Specifically in these models, the tariff reductions led to an increase in intra-bloc trade by 118 percent for Mexico, whereas the United States and Canada saw a 41 percent and 11 percent increase, respectively (Caliendo and Parro

[4]On April 3, 2018, the United States announced 25 percent tariffs on 1,333 Chinese products worth $50 billion. China retaliated with higher tariffs, resulting in a trade dispute between the two countries that is still ongoing

2015). As a counterfactual analysis, revoking NAFTA would decrease Mexico's overall welfare by 1.8 percent and drive sectoral real wages by up to 17 percent (Auer, Bonadio, and Levchenko 2018). Within the automotive industry, if the United States imposed a 25 percent Section 232 (national security) tariff on Mexico and Canada, then Mexico would experience a 40 percent decline in production (Head and Mayer 2019).

One of the central topics of the NAFTA renegotiation was stricter rules of origin for the automotive industry. The United States initially wanted to increase the Regional Content Requirement (RCR) from 62.5 percent to 85 percent. The three countries ultimately agreed to 75 percent. Using calibrated parameters, Head, Mayer, and Melitz (2023) find that a counterfactual experiment of raising the RCR to 85 percent and 100 percent would increase the consumer price by 0.4 and 1 percent, respectively. The researchers identify that the new level is not the optimal level according to the Laffer curve, resulting in lower employment levels of the United States. Rather than examining counterfactual experiments, this paper uses actual outcomes to determine the impact of the threat of terminating NAFTA.

When assessing the realized benefits of NAFTA, it is consistent with the literature that the agreement lowered prices for consumers and provided export opportunities for producers leading to economic growth, productivity improvements, and poverty reduction. However, these benefits were not equally distributed throughout Mexico.

Inequality and poverty declined relative to the rest of Mexico in the regions that were the most exposed to NAFTA (Hanson 2007). The states most impacted in the 1990s are measured using the share of FDI, imports, and exports assembly in state GDP. These regions are primarily along the border. Importing intermediate goods from the United States reduced the relative price of higher quality products, which increased real income inequality in urban areas (Faber 2014). Tariff reductions also led to higher wages for specific segments of the population. Multinational corporations and companies in export-intensive sectors demand highly skilled labor and tend to prioritize locations with well-developed transportation and communication infrastructure. As a result, skilled workers and those living near the United States saw an increase in wages

relative to the rest of Mexico (Hanson 2003).

Previous literature details the benefits NAFTA; however, research is limited on the impact of trade uncertainty imposed by renegotiating trade agreements. Wages and employment are sticky due to domestic labor policies. Thus, this paper exploits changes in foreign direct investment net inflows, which is more flexible, to show firms' responsiveness to uncertainty. According to the United States 2017 Investment Climate Statement, "Uncertainty regarding the content of the discussions and timeline for implementation of the future 'rules of the game' may impact Foreign Direct Investment (FDI) flows in 2017[5]." This predication was realized when the Consejo Mexicano de Negocios (CMN), translated as the Mexican Business Council, said it would reduce investments from their initial announcement of $33.5 billion (USD) to $31.43 billion (USD) in 2017 due to the uncertainty regarding NAFTA[6].

The existing literature confirms that FDI is directly linked to NAFTA. The agreement assured investors of Mexico's lasting commitment to reform, resulting in substantially higher FDI inflows (Waldkirch 2003). When NAFTA was signed, the United States' FDI in Mexico totaled $15.4 billion (USD). It is now $100.0 billion (USD) or 39 percent of all inflows. NAFTA generated FDI flows nearly 60 percent higher into Mexico than they would have been without the agreement (Cuevas, Messmacher, and Werner 2005). The majority of FDI flows to the northern states where the maquiladoras are located. Five years after NAFTA was signed, maquiladoras increased from 564 to 1,460 plants.

This paper most closely aligns with the trade literature modeling uncertainty. FTAs facilitate the greatest gains from trade when the trade-policy environment is experiencing uncertainty. It is evident following Portugal's accession to the European Community (EC) in 1986, which removed uncertainty regarding future trade policies and accounted for a significant fraction of the predicted growth (Handley and Limao 2015). Using data from the US and Cuba before the Reciprocal trade agreement act in 1934,

[5]https://www.state.gov/reports/2017-investment-climate-statements/
[6]https://www.reuters.com/article/idUSKBN18806Z/

Limão and Maggi (2015) find a positive correlation between the US tariffs and Cuba's adjustment openness. The firms that are the least sensitive to trade uncertainty shocks are those that are highly integrated exporters (Carballo 2018).

This paper addresses the gap in the literature regarding the impact of renegotiating existing RTAs. It is one of the first to study the effect of trade uncertainty from renegotiating a major trade agreement (NAFTA) on a highly sensitive short run measure (FDI flows). The United States relationship with Mexico is also unique due to maquiladoras, which encourage horizontal FDI. Understanding how different industries respond to the uncertainty is essential for implementing future policy safeguards.

4 Data

The exposure of trade uncertainty created by the renegotiation varies by location and industry. In theory, a state without an exporting industry should not be impacted by the renegotiations. In order to measure an industry and state's sensitivity to the uncertainty, I create the treatment variable: predicted tariff change (further described in the empirical specification below). It is constructed using 2016 Mexican exports, 2016 Mexican employment data, and Most Favored Nations tariff levels.

Mexico's exports by state and industry are from the Secretaria de Economia, translated Secretary of Economy. This paper uses Mexico's exports to the United States and Canada in 2016 (prior to the uncertainty shock). The export data span all 32 states and include 12,493 products specified at the six digit Harmonized Tariff Schedule (HTS). The exports are aggregated to the three-digit NAICs code using Pierce and Schott (2012) US HTS to NAICS concordance. In total, there are 30 exporting industries of which 29 industries export to the United States.

The 2016 employment data are from La Encuesta Nacional de Ocupación y Empleo (ENOE) translated as National Survey of Occupation and Employment. Data are collected quarterly by household surveys. Households are randomly selected and surveyed over the course of five quarters. Each quarter, one fifth of the sample is replaced with

new households. The data include 2016 total employment by state and industry.

The anticipated increase in tariff levels if NAFTA was abolished is the difference between the Most Favored Nations tariff and NAFTA tariffs. NAFTA tariffs are zero for all industries in 2016. The MFN data are reported by the World Trade Organization and are also at the six digit HTS level. These tariff levels are also aggregated to the three-digit NAICS code using Pierce and Schott (2012).

The triple difference estimates use three group identifiers: border, maquila, and top producer. The Mexico-Texas border states include Chihuahua, Baja California, Sonora, Coahuila de Zaragoza, Tamaulipas, and Nuevo Leon. Mexico's 2014 Census provides the data for maquila and top producer, which is the most recent Census before the renegotiations. The identifier, maquila, is if there was at least one maquila in the state and industry in 2014. A state and industry is identified as a top producer if the total gross production was in the top 70th percentile in 2014.

Table 1 shows the summary statistics for each of the indicator variables. Since the variables are time-invariant, the results are shown for a cross section of the data in 2017. The number of observations corresponds to the 32 states and 92 industries in the sample. Maquilas are present in 27 percent of the states and industries. Twenty percent of states and industries export to the United States, however, less than 1 percent of states and industries export exclusively to Canada.

To control for the United States-China trade war, I account for the increase in tariffs from the Most-Favoured-Nation (MFN) for Chinese imports to the United States. The data for the increase in tariffs are from the Peterson Institute for International Economics. These tariffs incrementally increase from 2018 to 2019. The tariffs are at the ten-digit HTS level, which is aggregated the three digit NAICS code using Pierce and Schott (2012). Table 2 shows the summary statistics for the maximum, minimum, and simple average change in tariffs. In 2018, the tariffs increased between 0 and 55 percentage points. On average, tariffs increased by 8.5 percentage points. In 2020, the average tariff increased by 20.7 percentage points. The impact of the Trade War is weighted by the share of United States imports from China by industry, which is from

United States Census.

Foreign direct investment (FDI) net inflows data are from the Secretaria de Economia, translated as the Ministry of Economy. It is collected by the Mexican National Registry of Foreign Investments, which requires investors to register FDI under the Ley de Inversión Extranjera (LIE) or Foreign Investment Law. FDI are in current 1,000,000 USD, and span from 2009 to 2019. FDI net inflows are adjusted for inflation using the United States Consumer Price Index (CPI) from the Bureau of Labor Statistics using 2008 as the base year. The United States is Mexico's top FDI net inflow contributor, representing approximately half of all FDI net inflow. FDI net inflows include new investments, accounts between companies, and reinvestment of profits. Negative FDI inflows occur when disinvestment by foreign investors is greater than the value of newly invested capital. Table 3 shows the summary statistics for FDI net inflows by state, industry, and year. Across all years, FDI net inflows range from -$2.1 million USD (in 2012) to $3.1 million USD (in 2010). On average, FDI net inflows range from $5.9 million USD to $14.9 million USD.

Figures 3 and 4 show how new investments and total investments vary by quarter. Although investment decisions are typically conducted in the previous fiscal year, firms may choose to abruptly stop investments once there is trade uncertainty. The gray shaded region is during the after period in the difference-in-differences specification and the blue shaded region represents the COVID pandemic. The two red bars are the quarters when NAFTA was first renegotiated and when President Trump threatened to terminate NAFTA, two significant periods of uncertainty. FDI flows are cyclical by quarter, however, new investments dropped after the renegotiations particularly for exporter state and industries. The quick responsiveness to uncertainty provides support for using FDI flows in the current year. Total investments by exporters and non-exporters follow a similar pattern to one another. The drop in investments after the uncertainty periods is no longer evident at the country level.

5 Empirical Specification

To estimate the effect of NAFTA renegotiations on Mexico's economic development, I estimate a difference-in-differences regression using the predicted tariff change as the treatment variable and control for the US-China Trade War. The Trade War control is represented by $TW_{t,s,i}$ for industry i at year t in state m.

$$TW_{t,s,i} = \begin{cases} 0 & \text{before 2018} \\ \frac{L_{s,i,2016}}{L_{i,2016}} \left(\frac{\text{Imports}_{US,C,2016,i}}{\text{Imports}_{US,2016,i}} \right) (\tau_{i,t} - \text{MFN}_i) & \text{otherwise} \end{cases} \tag{1}$$

The Trade War control first measures the change in tariffs by year between the United States and China, $\tau_{i,t} - \text{MFN}_i$. To determine how important the industry is for the United States, the change is weighted by Chinese imports to the United States as a share of all imports by industry. It is then weighted by the share of Mexico's state employment in each industry for 2016 to reflect the capability of the state and industry's ability to utilize new FDI flow. For the years prior to the Trade War, the value is zero.

Table 4 shows the summary statistics for the Trade War control. After adjusting the change in tariffs by Mexico's labor share, the minimum trade war difference is now zero for all observations. Adjusting the change in tariffs by capability and demand leads to the trade war variable ranging from 0 to 10 percentage points.

If NAFTA was terminated, goods would be subject to MFN tariffs. As such, the treatment variable is the predicted tariff change, $PT_{s,i}$, which is the difference in MFN tariff and NAFTA tariff weighted by the industry's export intensity measure. This independent variable measures the level of the expected threat. It is as follows:

$$PT_{s,i} = \left(\frac{Export_{2016,s,i}}{Export_{2016,s}} \right) (MFN_i - NAFTA_i) \tag{2}$$

The export intensity measure, $Export_{2016,s,i}/Export_{2016,s}$, captures the share of a state's exports to the United States in each industry prior to the negotiations. It is time invariant and measures how much of the exporting market a specific industry has in the

state. The values range from zero to one. If it is one, then it is the only industry that exports within the state. The prior is that an industry that is highly integrated with the United States would have high levels of exports. Since it sends a lot of products to the United States, it would be more exposed to the negative uncertainty from the renegotiation and be less incentivized to invest in FDI. Conversely, an industry that does not export to the United States shouldn't be impacted.

Table 5 reports the summary statistics for Mexico's export share to the United States, Canada, and both countries combined. The export intensity measure is time invariant, thus the summary statistics are for a cross section of data in 2017. On average, the industry represents 1 percent of the state's exports to the United States and Canada. At most, an industry represents 94 percent of the state's exports to the United States.

The means and standard deviations of the export intensity measure by each sample restriction are shown in Table 6. The export intensity measure is either the same or larger for each of the sample restrictions. There are 792 states and industries with a maquila, which represent on average 3 percent of the state's exports. Restricting to border states and top producers, the average share of exports is 1 and 2 percent, respectively.

As previously shown in Table 2, the change in tariffs, $MFN_i - NAFTA_i$, can be as much as 55 percentage points. After adjusting the change by the industry's export share, the largest change in tariffs is 31.55 percentage points (see Table 7). The average tariff change weighted by the industry's export share is 0.06 percentage points. For exporters, the average predicted tariff change rises to 0.28 percentage points.

The difference-in-differences specification is as follows:

$$FDI_{t,s,i} = \alpha + \beta PT_{t,s,i} \times After_t + \gamma TW_{t,s,i} + \delta_t + \delta_{s,i} + \varepsilon_{t,s,i} \tag{3}$$

The outcome variable is $FDI_{t,s,i}$, which represents the total FDI net inflow. The treatment variable is interacted with "After", which is an indicator variable that is a

one for observations starting in 2017. In this setting, the renegotiation was exogenous and unanticipated because there wasn't an expiration date on NAFTA. It was also uncommon for the United States to renegotiate existing RTAs. The parameter of interest is β. If it is negative, then investors were induced to decrease FDI for states and industries sensitive to the renegotiations. Conversely, the parameter γ should be positive to reflect the substitution of FDI away from China and into Mexico from the Trade War. Year as well as state and industry fixed effects are denoted as δ_t, $\delta_{s,i}$, respectively.

To capture whether the change in FDI net inflow is due to horizontal or vertical FDI, I use a triple differences estimate with three different group identifiers. It is as follows:

$$\begin{aligned} FDI_{t,s,i} = \alpha_1 + \alpha_2 PT_{s,i} + \alpha_3 After_t + \alpha_4 G_{s,i} + \alpha_5 PT_{s,i} \times After_t \\ + \alpha_6 PT_{s,i} \times G_{s,i} + \alpha_7 G_{s,i} \times After_t + \alpha_8 PT_{s,i} \times After_t \times G_{s,i} + \varepsilon_{t,s,i} \end{aligned} \tag{4}$$

The group identifier, $G_{s,i}$, is either exporter, border, maquila, or top producer depending on the model specification. The parameter of interest is α_8. If one of the groups have a larger magnitude that is negative and statistically significant, then it will show whether horizontal or vertical FDI is impacted more by the uncertainty. For example, if the greatest magnitude is $alpha_8$ when the group is top producer, then horizontal FDI net inflow is the most responsive.

Table 8 shows the mean and standard deviation for each of the variables of interest for the full sample, pre-period, and post. Note that predicted tariff and trade war are zero in the per-period due to construction. Similarly, the share of an industry's exports is consist across all time periods since it is time invariant. Exporting states and industries receive the most FDI net inflows. Prior to 2017, exporters recieved \$25.66 million USD on average. After NAFTA renegotiations, FDI net inflows dropped to \$23.06 million USD for exporters. States and industries with a maquila saw a similiar

drop in FDI. Maquilas received $20.91 million USD in the pre-period and $20.12 million USD in the post-period. Border states and top producers increased FDI net inflows after the renegotions. Overall, FDI net inflows are higher than their counterparts for maquilas, border states, and top producers. For example, across the whole sample the bottom 70th percentile of producers receive approximately $2.7 million USD, while the top 70th percentile of producers receive approximately $19 million USD. Across the full sample, states and industries recieve on average $9.22 million USD.

I also run the analysis using a Poisson Pseudo Maximum Likelihood (PPML) estimate, which converts the dependent variabl to the logarithm of FDI net inflows. The benefit of using a PPML is to deal with zero FDI as well as prevent heteroskedasticty from yielding biased estimates. The new difference-in-differences estimation equation is as follows:

$$lnFDI_{t,s,i} = \alpha + \beta PT_{t,s,i} \times After_t + \gamma TW_{t,s,i} + \delta_t + \delta_{s,i} + ln\varepsilon_{t,s,i} \tag{5}$$

Similarly, the new triple differences specification is as follows:

$$\begin{aligned} lnFDI_{t,s,i} = \alpha_1 + \alpha_2 PT_{s,i} + \alpha_3 After_t + \alpha_4 G_{s,i} + \alpha_5 PT_{s,i} \times After_t \\ + \alpha_6 PT_{s,i} \times G_{s,i} + \alpha_7 G_{s,i} \times After_t + \alpha_8 PT_{s,i} \times After_t \times G_{s,i} + ln\varepsilon_{t,s,i} \end{aligned} \tag{6}$$

Equations 5 and 6 do not allow for negative FDI net inflows. Thus, I replace negative FDI with zero. Figure 5 shows the proportion of negative FDI net inflows to positive FDI net inflows. The greatest value of negative net inflows was in 2014, which was almost $5 billion USD. The PPML models prevent a specific industry and state with a large volume of FDI to drive the results. The parameters of interest continue to be β and $alpha_8$. If the sign of β remains negative, then it would further suggest evidence that investors were induced to reduce their FDI due to the renegotiations.

In all specifications, I am assuming that export intensive industries would have had the same trend in FDI as non-export intensive industries if President Trump did not announce NAFTA renegotiation. To defend this assumption, I look at the trends in outcome variables before the renegotiations. One possible concern for this analysis is if I do not have enough data from the period before the uncertainty occurred to test these trends. However, I am constrained by the 2008 recession in the United States. Mexico's economy is integrated with the United States. As such, export and non-export intensive industries reacted differently in response to the recession. Likewise, it would be beneficial to see if the investments dropped after USMCA was signed. However, the Senate signed off on USMCA early 2020 when there was a global pandemic, which in itself caused investments to fall.

6 Results

Table 9 shows the results for equation 3 in column 1 and equation 4 in columns 2 through 4. The highlighted boxes represent the key parameter of interest. Each model uses the average predicted tariff and average trade war. The standard errors are clustered by state and industry. As shown by column 1, during the renegotiations, a threat of a one percent increase in tariffs is associated with a decrease in FDI by $2.5 million USD for industries that are the sole exporter of their state. Recall, that the average FDI net inflow was $9.2 million USD. Thus, the uncertainty decreased FDI on average by 27 percent. For exporting states and industries, average FDI was $24.95 million USD, resulting in a decrease of 10 percent due to the renegotiations.

Table 10 shows the PPML results (equations 5 and 6). Column 1 shows that the US-China Trade War increased FDI net inflow by 24 percent. However, accounting for the trade war, NAFTA renegotiations decreased FDI net inflow by 3.1 percent. The PPML triple differences provide similar results. The trade war increased FDI net inflows between 25 and 26 percent, while NAFTA renegotiations decreased FDI by 3 to 97 percent (depending on empirical specification). Interestingly, Column 2

suggests that the uncertainty induced Maquila states and industries to increase FDI by 87 percent. Column 4 shows similar results for top producers. After the NAFTA renegotiations, top producers increased FDI net inflows by 95 percent.

7 Potential Concerns and Robustness Checks

The first primary concern with these findings may be that FDI net inflows are often zero for states and industries. Table 11 shows how often FDI net inflows are negative, zero, and positive by year. In 2016, there were 2,243 states and industries without FDI. This represents 76 percent of states and industries. As such, I run equations 3 through 6 restricting the sample to only states and industries that have non-zero FDI net inflows in at least one of the years between 2009 and 2019. The sample is thus restricted to 13,464 observations.

Table 12 displays the results for equations 3 and 4 using the new sample. Column 1 reveals that the uncertainty induced a greater investment response than previously estimated. Investors reduce FDI net inflows by $2.9 million USD in response to the renegotiations. The triple difference estimates continue to not be statistically significant. Table 13 displays the PPML results (equations 5 and 6) using the new restricted sample. The results are exactly the same as Table 10.

A second primary concern is how the different types of FDI net inflows respond to the uncertainty. Figure 6 shows the variation in FDI type by year. I would assume that new investments are the most responsive to the NAFTA renegotiations. New investments represent between 19 and 61 percent of FDI net inflows depending on the year. Due to data limitations, I am unable to disentangle the type of FDI inflow by state, industry, and year. Next steps include requesting the underlying proprietary data from Mexico's Secretary of the Economy to run the analysis using only new investments.

A third concern would be that the United States represents only half of Mexico's FDI net inflow. This would be a concern if investments from the United States respond

differently than investments from other countries. Again, I am unable to disentangle the country of origin by state, industry, and year. However, the underlying propriety data would also resolve this issue.

In the future, I plan to also run a placebo analysis by conducting the same analysis for different Latin American countries. The effects should be minimal, however, there is a potential for investors to substitute away from Mexico and to a different country. There may also be some spillovers due to global value chains.

8 Conclusion

Previous literature details the benefits of trade agreements; however, research is limited on how renegotiating agreements affect trade and investment uncertainty. As RTAs become outdated, renegotiating agreements will likely become more common and understanding the effects on investment decisions has important policy implications.

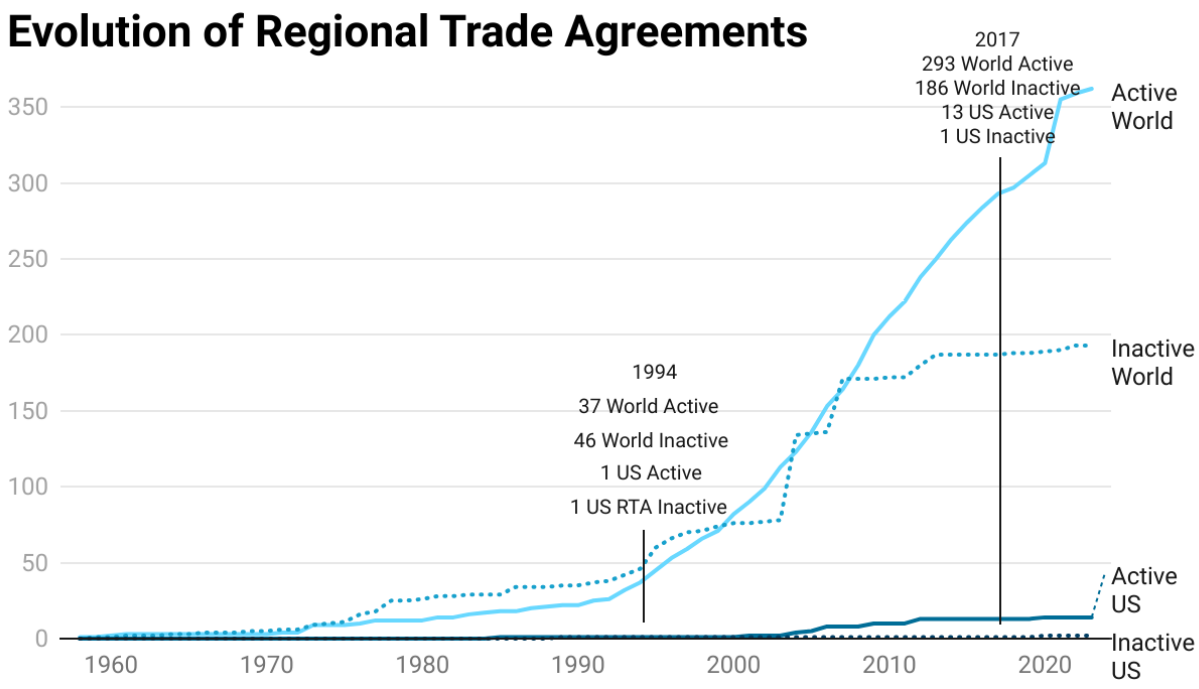
This paper addresses the gap in the literature regarding the impact of renegotiating existing RTAs. It is one of the first to study the effect of trade uncertainty from renegotiating a major trade agreement (NAFTA) on a highly sensitive short run measure (FDI net inflows). The United States relationship with Mexico is also unique due to maquiladoras, which encourage horizontal FDI.

This paper employs three estimation strategies: difference-in-differences, triple differences, and PPML estimates. I exploit the variation in industry and state exposure to NAFTA renegotiations. Controlling for the US-China Trade War, a threat of a one percent increase in tariffs is associated with a decrease in FDI by $2.5 million USD for industries that are the sole exporter of their state. Using a Poisson Pseudo Maximum Likelihood estimator, the US-China Trade War accounts for an increase in FDI by 24 percent while the NAFTA renegotiations decreased FDI by 3 percent. Future research is necessary to disentangle the impacts of NAFTA renegotiations on vertical and horizontal FDI net inflows.

From a policy perspective, the decrease in investment behavior suggests that poten-

tial policy solutions include incorporating clauses against immediate trade agreement termination and overtime incrementally increasing tariffs if the agreement is adjusted or abolished. Both suggestions limit the extent of the uncertainty shock.

Figure 1



Note: Notifications of RTAs: goods, services & accessions to an RTA are counted separately. The cumulative lines show the number of RTAs/notifications currently in force.

Source: WTO Secretariat • Created with Datawrapper

Figure 2

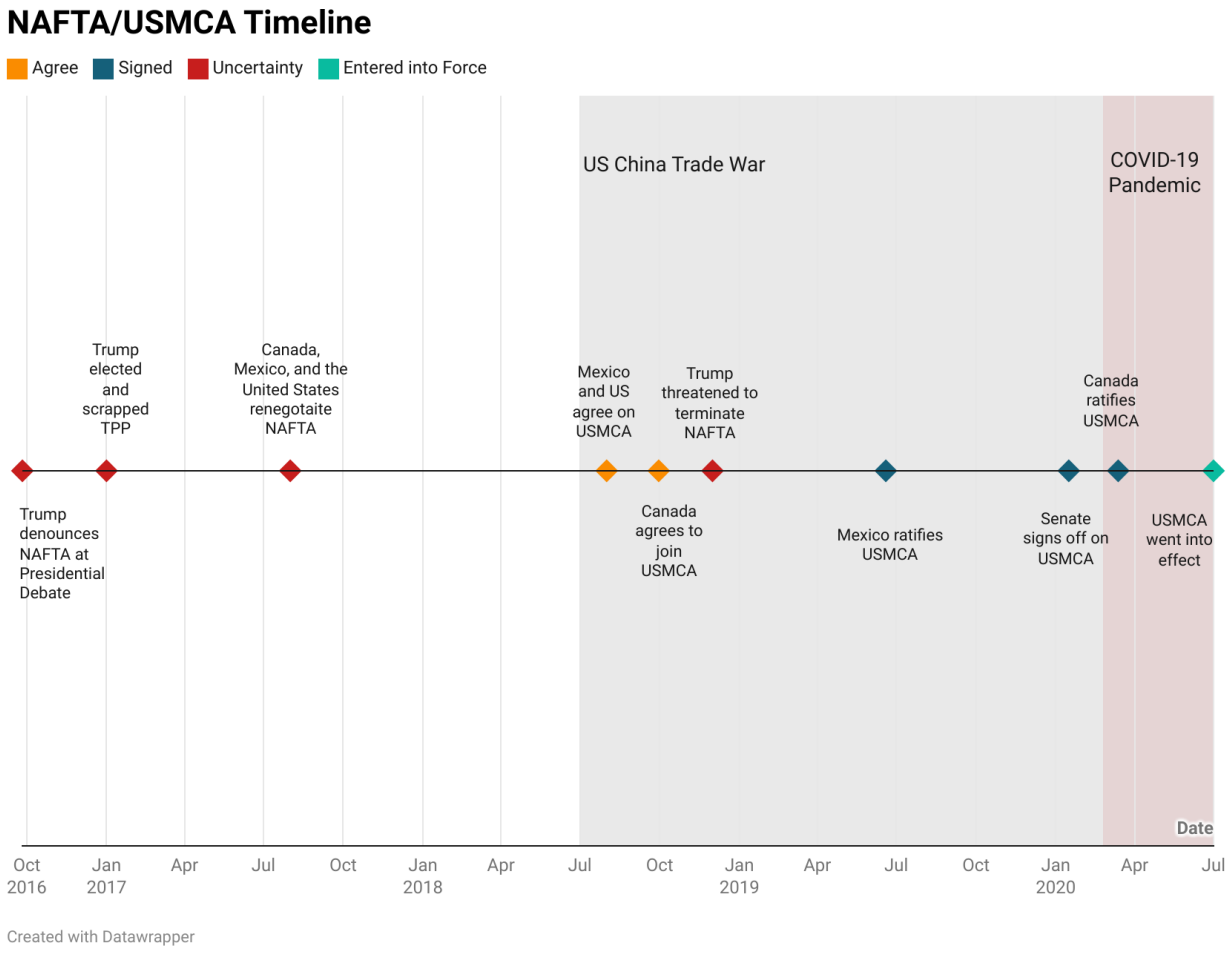
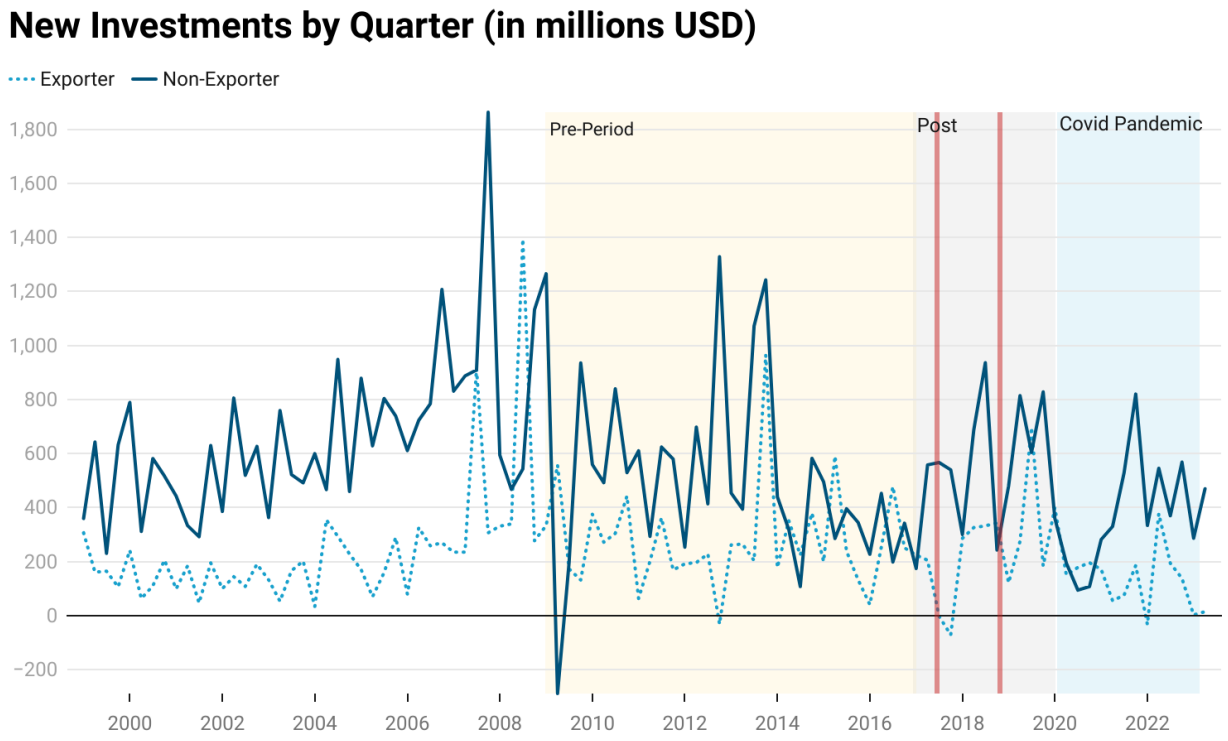

NAFTA/USMCA Timeline
Agree
Signed
Uncertainty
Entered into Force
US China Trade War
COVID-19 Pandemic
Trump elected and scrapped TPP
Canada, Mexico, and the United States renegotaite NAFTA
Mexico and US agree on USMCA
Trump threatened to terminate NAFTA
Canada ratifies USMCA
Trump denounces NAFTA at Presidential Debate
Canada agrees to join USMCA
Mexico ratifies USMCA
Senate signs off on USMCA
USMCA went into effect
Date
Oct 2016
Jan 2017
Apr
Jul
Oct
Jan 2018
Apr
Jul
Oct
Jan 2019
Apr
Jul
Oct
Jan 2020
Apr
Jul
Created with Datawrapper

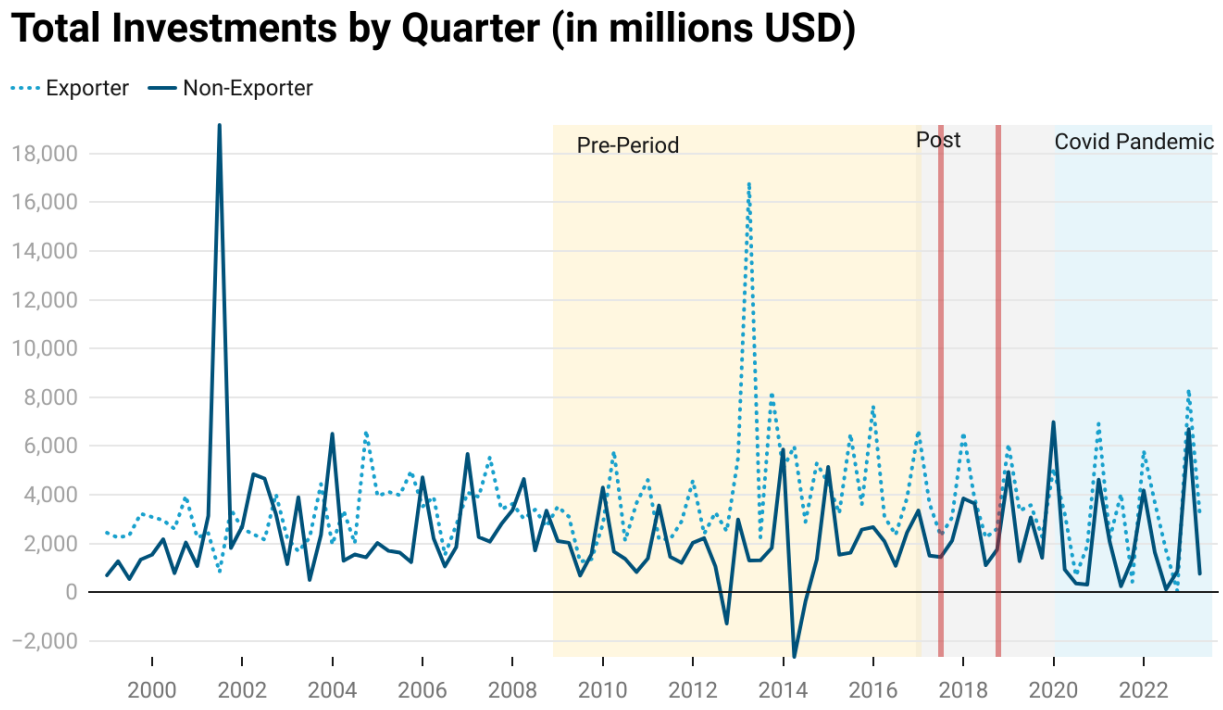
Figure 3



Notes: FDI flows are adjusted for inflation using the CPI with a base year of 2008. The aggregation is slightly lower than national totals due to anonymized confidential data. Negative FDI inflows occur when disinvestment by foreign investors is greater than the value of newly invested capital in Mexico.

Source: Author's calculations using Mexico's Ministry of Economy • Created with Datawrapper

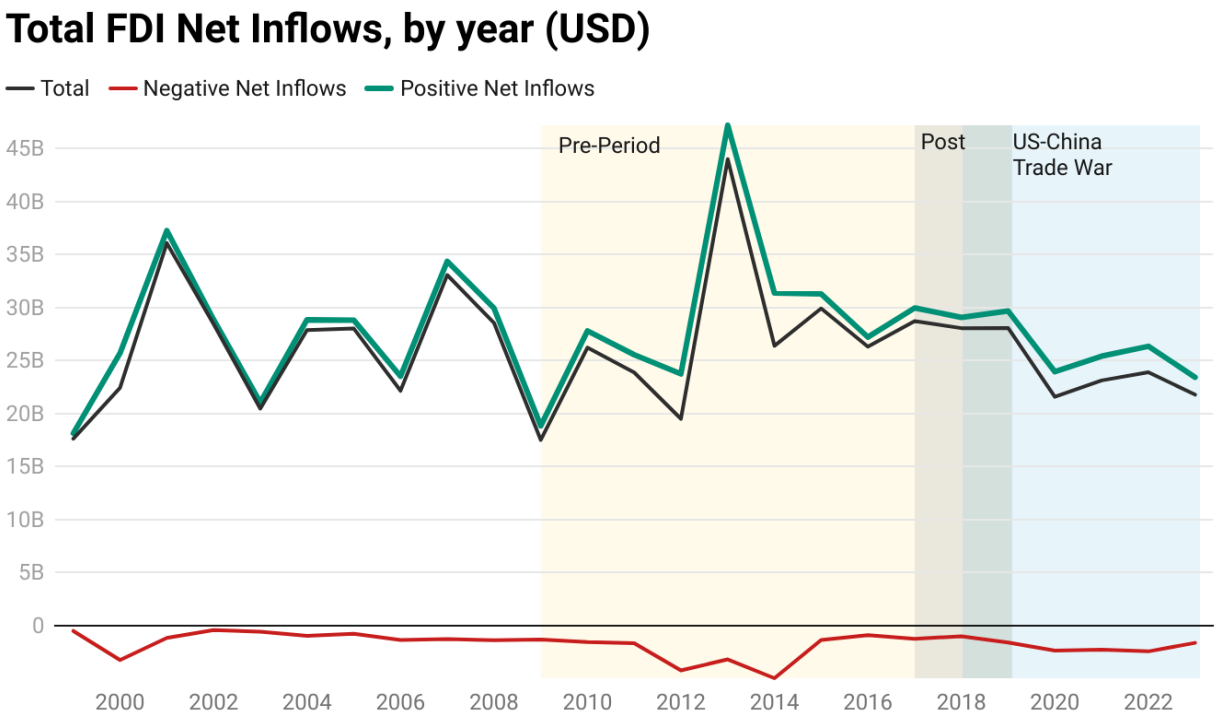
Figure 4



Notes: FDI flows are adjusted for inflation using the CPI with a base year of 2008. The aggregation is slightly lower than national totals due to anonymized confidential data. Negative FDI inflows occur when disinvestment by foreign investors is greater than the value of newly invested capital in Mexico.

Source: Author's calculations using Mexico's Ministry of Economy • Created with Datawrapper

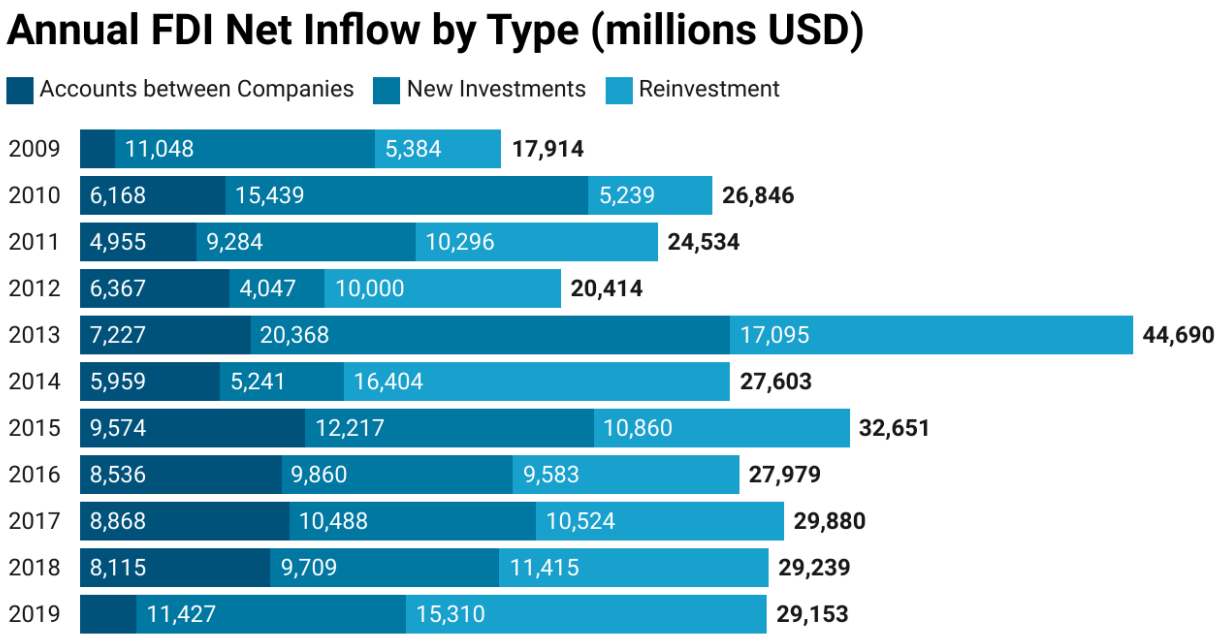
Figure 5



Notes: FDI flows are adjusted for inflation using the CPI with a base year of 2008. The aggregation is slightly lower than national totals due to anonymized confidential data. Negative FDI inflows occur when disinvestment by foreign investors is greater than the value of newly invested capital in Mexico.

Source: Author's calculations using Mexico's Ministry of Economy • Created with Datawrapper

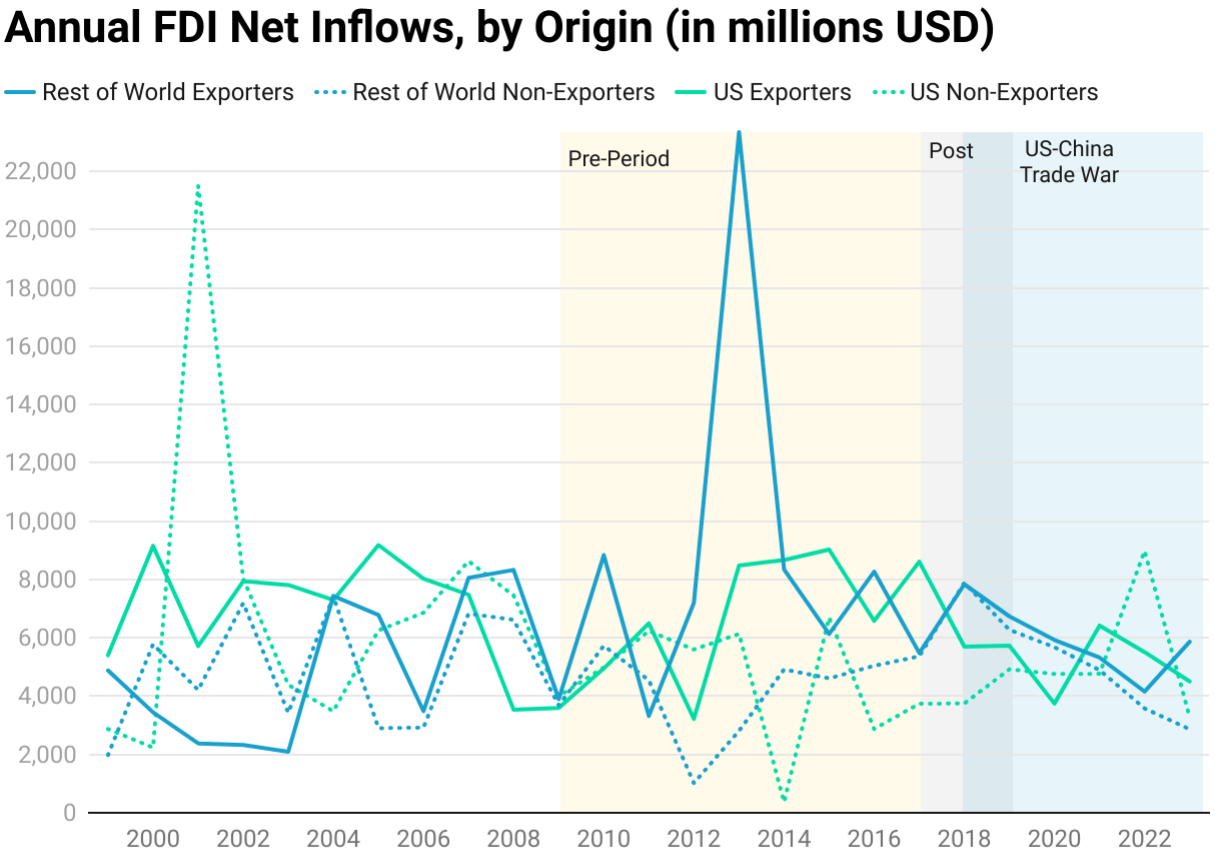
Figure 6



Notes: FDI flows are adjusted for inflation using the CPI with a base year of 2008. The aggregation is slightly lower than national totals due to anonymized confidential data. Negative FDI inflows occur when disinvestment by foreign investors is greater than the value of newly invested capital in Mexico.

Source: Author's calculations using Mexico's Ministry of Economy • Created with Datawrapper

Figure 7



Notes: FDI flows are adjusted for inflation using the CPI with a base year of 2008. The aggregation is slightly lower than national totals due to anonymized confidential data. Negative FDI inflows occur when disinvestment by foreign investors is greater than the value of newly invested capital in Mexico.

Source: Author's calculations using Mexico's Ministry of Economy • Created with Datawrapper

Table 1: Summary Statistics Indicator Variables

	(1)	(2)	(3)	(4)	(5)
VARIABLES	N	mean	sd	min	max
Exporter to US	2,944	0.20	0.40	0	1
Exporter to Canada	2,944	0.14	0.35	0	1
Exporter to NAFTA	2,944	0.20	0.40	0	1
Top Producer	2,944	0.40	0.49	0	1
Border	2,944	0.19	0.39	0	1
Maquila	2,944	0.27	0.44	0	1

Notes: The summary statistics are for a cross section of the data in 2017. The number of observations corresponds to the 32 states and 92 industries in the sample. A state and industry is identified as a maquila or top producer using 2014 Census. Border states include Chihuahua, Baja California, Sonora, Coahuila de Zaragoza, Tamaulipas, and Nuevo Leon.

Table 2: Summary Statistics Change in Tariffs

		(1)	(2)	(3)	(4)	(5)
VARIABLES	Year	N	mean	sd	min	max
Max Change in Tariffs	2018	30	18.91	12.04	10	55
	2019	30	28.00	7.26	25	50
Avg Change in Tariffs	2018	30	8.49	4.18	0.74	17.06
	2019	30	20.68	3.66	12.46	28.68
Min Change in Tariffs	2018	30	0.33	1.83	0	10
	2019	30	1.33	5.24	0	25

Notes: The tariff levels are at the ten-digit HTS level. The tariffs are aggregated to the three-digit NAICS code using Pierce and Schott (2012) US HTS to NAICS concordance. N=30 represents the thirty exporting industries. The change in tariffs is reflected by the difference of the US tariffs against China and the Most Favored Nations tariff level. The average change in tariff levels is the simple average.

Table 3: Summary Statistics FDI

	(1)	(2)	(3)	(4)	(5)
Year	N	mean	sd	min	max
2009	2,944	5.943949	44.80212	-145.365	1703.073
2010	2,944	8.902877	74.1353	-185.058	3098.087
2011	2,944	8.105831	56.71938	-234.472	1634.626
2012	2,944	6.621387	60.78375	-2148.13	867.5181
2013	2,944	14.94144	104.7752	-438.948	2367.104
2014	2,944	8.960205	71.08874	-804.367	2166.27
2015	2,944	10.15706	62.04742	-210.14	1668.176
2016	2,944	8.931118	54.87162	-166.773	1469.93
2017	2,944	9.750308	61.26403	-331.132	1546.533
2018	2,944	9.527049	55.14764	-216.969	1287.945
2019	2,944	9.532587	59.41341	-171.897	1545.094
All years	32,384	9.215801	65.83043	-2148.13	3098.087

Notes: The full sample size, N=32,384, correspondes to 32 states and 92 industries across the years from 2009 to 2019. Negative FDI inflows occur when disinvestment by foreign investors is greater than the value of newly invested capital in Mexico.

Table 4: Summary Statistics Us-China Trade War

		(1)	(2)	(3)	(4)	(5)
VARIABLES	Year	N	mean	sd	min	max
Trade War Max	2018	2,944	0.01	0.20	0	9.23288
	2019	2,944	0.01	0.22	0	10.22187
Trade War Avg	2018	2,944	0.00	0.02	0	0.93
	2019	2,944	0.00	0.11	0	5.09

Notes: Summary statistics for Trade War minimum are not shown due to being valued as zero for all years. This is because the share of an industry's labor is zero for all non-zero minimum tariff changes. The number of observations corespond to 32 states and 92 industries.

Table 5: Summary Statistics Export Intensity Measure

	(1)	(2)	(3)	(4)	(5)
VARIABLES	N	mean	sd	min	max
EIM US	2,944	0.01	0.06	0	0.94
EIM Canada	2,944	0.01	0.07	0	1
EIM NAFTA	2,944	0.01	0.06	0	0.94

Notes: The summary statistics are for a cross section of the data in 2017. The number of observations corresponds to the 32 states and 92 industries in the sample. EIM is time invariant. It measures how much of the exporting market a specific industry has in the state. Exports to each destination are at the six-digit HTS level. The exports are aggregated to the three-digit NAICS code using Pierce and Schott (2012) US HTS to NAICS concordance.

Table 6: Summary Statistics Export Intensity Measure by Sample Restriction

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Not Maquila	Maquila	Not Border	Border	Not Top Producer	Top Producer	Full Sample
VARIABLES							
EIM US	0.005	0.028	0.011	0.011	0.007	0.017	0.011
	(0.047)	(0.094)	(0.067)	(0.047)	(0.055)	(0.075)	(0.064)
Sample Size	2,152	792	2,392	552	1,767	1,177	2,944

Notes: The table shows means and standard deviations in parantheses. The summary statistics are for a cross section of the data in 2017. The full sample corresponds to the 32 states and 92 industries in the sample. EIM is time invariant. It measures how much of the exporting market a specific industry has in the state. Exports to the United States are at the six-digit HTS level. The exports are aggregated to the three-digit NAICS code using Pierce and Schott (2012) US HTS to NAICS concordance. A state and industry is identified as a maquila or top producer using 2014 Census. Border states include Chihuahua, Baja California, Sonora, Coahuila de Zaragoza, Tamaulipas, and Nuevo Leon. The tariff levels are at the ten-digit HTS level.

Table 7: Summary Statistics Predicted Tariff

		(1)	(2)	(3)	(4)	(5)
VARIABLES	Sample	N	mean	sd	min	max
Predicted Tariff Min	All	2,944	0.04	0.64	0	31.24
	Exporter	581	0.21	1.42	0	31.24
	Maquila	792	0.11	1.17	0	31.24
	Border	552	0.02	0.08	0	1.23
	Top Producer	1,177	0.07	0.96	0	31.24
Predicted Tariff Max	All	2,944	0.81	0.89	0	31.55
	Exporter	581	0.41	1.96	0	31.55
	Maquila	792	0.17	1.96	0	31.55
	Border	552	0.04	0.17	0	2.73
	Top Producer	1,177	0.11	1.10	0	31.55
Predicted Tariff Avg	All	2,944	0.06	0.70	0	31.43
	Exporter	581	0.28	1.56	0	31.43
	Maquila	792	0.14	1.24	0	31.43
	Border	552	0.03	0.11	0	1.35
	Top Producer	1,177	0.09	1.02	0	31.43

Notes: The summary statistics are for a cross section of the data in 2017. The tariffs are aggregated to the three-digit NAICS code using Pierce and Schott (2012) US HTS to NAICS concordance. For the full sample, the number of observations corresponds to the 32 states and 92 industries.The change in tariffs is reflected by the difference the Most Favored Nations tariff level and NAFTA's tariff level. The average change in tariff levels is the simple average. A state and industry is identified as a maquila or top producer using 2014 Census. Border states include Chihuahua, Baja California, Sonora, Coahuila de Zaragoza, Tamaulipas, and Nuevo Leon. The tariff levels are at the ten-digit HTS level.

Table 8: Summary Statistics of Variables of Interest for Full Sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Not Exporter	Exporter	Not Maquila	Maquila	Not Border	Border	Not Top Producer	Top Producer	Full Sample
VARIABLES									
Full Time Period									
FDI (millions USD)	5.35	24.95	4.99	20.70	8.047	14.28	2.74	18.94	9.22
	(48.71)	(109.6)	(49.49)	(96.31)	(62.90)	(77.06)	(35.66)	(93.67)	(65.83)
Share of Industry's Exports	7.15e-06	0.055	0.005	0.028	0.011	0.011	0.007	0.017	0.011
	(0.000)	(0.135)	(0.047)	(0.094)	(0.067)	(0.047)	(0.055)	(0.075)	(0.0638)
Predicted Tariff	5.36e-06	0.076	0.007	0.038	0.0169	0.007	0.009	0.024	0.015
	(0.000)	(0.821)	(0.165)	(0.651)	(0.405)	(0.058)	(0.185)	(0.533)	(0.366)
Trade War	2.65e-05	0.0022	0.0000	0.0016	0.00048	0.00033	6.35e-05	0.0010	0.0005
	(0.001)	(0.076)	(0.001)	(0.065)	(0.037)	(0.011)	(0.002)	(0.053)	(0.034)
Sample Size	25,993	6,391	23,672	8,712	26,312	6,072	19,437	12,947	32,384
Pre-Period									
FDI (millions USD)	4.992	25.66	4.713	20.91	7.993	13.74	2.614	18.76	9.070
	(50.02)	(114.6)	(52.35)	(98.58)	(66.01)	(77.41)	(37.90)	(96.78)	(68.33)
Share of Industry's Exports	7.15e-06	0.055	0.005	0.028	0.011	0.011	0.007	0.017	0.011
	(0.000)	(0.135)	(0.047)	(0.094)	(0.067)	(0.047)	(0.055)	(0.075)	(0.0638)
Predicted Tariff	0	0	0	0	0	0	0	0	0
	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Trade War	0	0	0	0	0	0	0	0	0
	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Sample Size	18,904	4,648	17,216	6,336	19,136	4,416	14,136	9,416	23,552
Post									
FDI (millions USD)	6.295	23.06	5.732	20.12	8.191	15.72	3.070	19.41	9.603
	(45.02)	(94.71)	(40.89)	(89.98)	(53.74)	(76.11)	(28.86)	(84.83)	(58.66)
Share of Industry's Exports	7.15e-06	0.055	0.005	0.028	0.011	0.011	0.007	0.017	0.0109
	(0.000)	(0.135)	(0.047)	(0.094)	(0.067)	(0.047)	(0.055)	(0.075)	(0.0638)
Predicted Tariff	1.96e-05	0.280	0.0249	0.138	0.0621	0.0257	0.0333	0.0883	0.0553
	(0.000)	(1.555)	(0.316)	(1.240)	(0.774)	(0.109)	(0.353)	(1.017)	(0.699)
Trade War	9.72e-05	0.00796	8.24e-05	0.00591	0.00175	0.00120	0.0002	0.004	0.002
	(0.002)	(0.145)	(0.001)	(0.124)	(0.071)	(0.021)	(0.005)	(0.102)	(0.065)
Sample Size	7,089	1,743	6,456	2,376	7,176	1,656	5,301	3,531	8,832

Notes: The table shows means and standard deviations in parantheses. The full sample size, N=32,384, correspondes to 32 states and 92 industries across the years from 2009 to 2019. Both the Predicted Tariff and Trade War variables are simple averages of the tariffs aggregated to the three-digit NAICS level.

Table 9: Regression 1

	(1)	(2)	(3)	(4)
VARIABLES	Baseline	Maquila	Border	Top Producer
Average Predicted Tariff	-2.497**	-4.427	-2.667***	-4.224
	(1.130)	(3.055)	(0.911)	(2.945)
Trade War	12.67	13.05	12.57	12.63
	(11.68)	(11.75)	(11.66)	(11.67)
Average Predicted Tariff * Maquila		2.357		
		(3.396)		
Maquila * After		-1.706		
		(2.012)		
Average Predicted Tariff * Border State			41.86	
			(118.5)	
Border State * After			0.620	
			-2.618	
Average Predicted Tariff * Top Producer				2.030
				(3.278)
Top Production * After				0.200
				(1.472)
State*Industry FE	Yes	Yes	Yes	Yes
Observations	32,384	32,384	32,384	32,384
R-squared	0.420	0.420	0.420	0.420
Notes: The regression includes state-industry and year-fixed effects, and standard errors are clustered at the state-industry level. The highlighted boxes correspond to the key coefficients of				
Robust standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

Table 10: Regression 2

	(1)	(2)	(3)	(4)
VARIABLES	Baseline	Maquila	Border	Top Producer
Average Predicted Tariff	-0.0308***	-0.885***	-0.0316***	-0.972***
	(0.0102)	(0.0916)	(0.00729)	(0.136)
Trade War	0.243***	0.260***	0.251***	0.248***
	(0.0858)	(0.0892)	(0.0887)	(0.0871)
Average Predicted Tariff * Maquila		0.867***		
		(0.0925)		
Maquila * After		-0.193		
		(0.123)		
Average Predicted Tariff * Border State			0.0940	
			(0.599)	
Border State * After			0.0971	
			(0.174)	
Average Predicted Tariff * Top Producer				0.952***
				(0.136)
Top Production * After				-0.232
				(0.175)
State*Industry FE	Yes	Yes	Yes	Yes
Observations	13,145	13,145	13,145	13,145
Notes: The regression includes state-industry and year-fixed effects, and standard errors are clustered at the state-industry level. The highlighted boxes correspond to the key coefficients of interest.				
Robust standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

Table 11: Concern 1

	(1)	(2)	(3)	(3)
Year	Negative	Zero	Positive	Full Sample
2009	120	2,121	703	2,944
2010	160	2,135	649	2,944
2011	114	2,092	738	2,944
2012	108	2,126	710	2,944
2013	113	2,077	754	2,944
2014	136	2,201	607	2,944
2015	81	2,218	645	2,944
2016	71	2,243	630	2,944
2017	84	2,191	669	2,944
2018	99	2,254	591	2,944
2019	110	2,205	629	2,944
Total	1,196	23,863	7,325	32,384

Notes: The full sample size, N=32,384, correspondes to 32 states and 92 industries across the years from 2009 to 2019. Negative FDI inflows occur when disinvestment by foreign investors is greater than the value of newly invested capital in Mexico.

Table 12: FE Robustness Check

	(1)	(2)	(3)	(4)
VARIABLES	Baseline	Maquila	Border	Top Producer
Average Predicted Tariff	-2.910***	-7.594	-3.066***	-7.202
	(1.039)	(5.546)	(0.773)	(5.239)
Trade War	12.47	13.25	12.42	12.54
	(11.65)	(11.82)	(11.65)	(11.67)
Average Predicted Tariff * Maquila		5.390		
		(5.736)		
Maquila * After		-4.206		
		(3.623)		
Average Predicted Tariff * Border State			4.807	
			(5.422)	
Border State * After			-1.008	
			(2.911)	
Average Predicted Tariff * Top Producer				55.57
				(168.8)
Top Production * After				0.725
				(6.230)
State*Industry FE	Yes	Yes	Yes	Yes
Observations	13,464	13,464	13,464	13,464
R-squared	0.405	0.405	0.405	0.405
Notes: The regression includes state-industry and year-fixed effects, and standard errors are clustered at the state-industry level. The highlighted boxes correspond to the key coefficients of interest. The number of observations corresponds to only states and industries with non-zero FDI net inlfows.				
Robust standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

Table 13: PPML Robustness Check

	(1)	(2)	(3)	(4)
VARIABLES	Baseline	Maquila	Border	Top Producer
Average Predicted Tariff	-0.0308***	-0.885***	-0.0316***	-0.972***
	(0.0102)	(0.0916)	(0.00729)	(0.136)
Trade War	0.243***	0.260***	0.251***	0.248***
	(0.0858)	(0.0892)	(0.0887)	(0.0871)
Average Predicted Tariff * Maquila		0.867***		
		(0.0925)		
Maquila * After		-0.193		
		(0.123)		
Average Predicted Tariff * Border State			0.952***	
			(0.136)	
Border State * After			-0.232	
			(0.175)	
Average Predicted Tariff * Top Producer				0.0940
				(0.599)
Top Production * After				0.0971
				(0.174)
State*Industry FE	Yes	Yes	Yes	Yes
Observations	13,145	13,145	13,145	13,145

Notes: The regression includes state-industry and year-fixed effects, and standard errors are clustered at the state-industry level. The highlighted boxes correspond to the key coefficients of interest. The number of observations corresponds to only states and industries with non-zero FDI net inlfows.

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

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