Cost of U.S. New Protectionism for Mexico

Kayhan Koleyni*
Eastern New Mexico University

December 30, 2020

Abstract

We investigate the short-run impact of new wave of U.S. protectionism on Mexico's economy. First, we use event studies approach to see the impact of changes in trade policies on Mexico's imports and exports for the period of 2016-2019. Second, we apply Zoutman et al. (2018) approach to estimate the trade elasticities for Mexico using the six-digit level of the Harmonized System product codes. Third, we modify a small open economy DSGE model developed by Christiano et al. (2011) to study the effects of U.S. protectionism on Mexico's economy and the impacts of potential changes of trade policies on Mexico's economy through different bilateral trade shocks. The estimated elasticities of Mexico's imports demand and exports supply are -1.08 and 0.44 respectively. Our result shows that in the short run, the imposition of 10 percent tariffs on Mexico's exports potentially may reduce the Mexico's GDP to more than 4 percent, and 10 percent retaliatory tariffs on Mexico's imported consumption goods may reduce consumption by less than 2 percent and increase CPI inflation by less than 5 percent.

Keywords: Protectionism, Import Demand Function, DSGE, Tariff, Mexico

JEL Codes: F14, F41, F50, E32

*Email: kayhan.koleyni@enmu.edu, College of Business 217, Eastern New Mexico University, 1500 S Ave K, Portales, NM, USA. We would like to thank Maroula Khraiche, Michael A. Olabisi and other participants for comments at the Western Economic Association meeting. This work was supported by Eastern New Mexico University FRID Grants. The views expressed herein are those of the author and do not necessarily reflect the views of institution.

1 Introduction

Recent wave of protectionism and the rise of nationalism in the U.S. started with changes in immigration policies, reshaping the U.S. immigration system, renegotiation of NAFTA which led to a new trade deal known as USMCA along with the imposition of new tariffs that sparkled a new trade war, have enormous impacts not only on U.S. economy but also on other highly inter-connected economies. In response to U.S. tariffs, China, the European Union, Russia, Canada, Turkey, Mexico, Switzerland, Norway, India, and Korea have all filed cases against the United States at the World Trade Organization. Additionally, many countries retaliated against the U.S. actions by applying tariffs of their own. (Amiti et al., 2019).

This return to protection is unprecedented in the post-war era due to the sizes of the countries involved, the magnitudes of the tariff increases, and the breadth of tariffs across sectors (Fajgelbaum et al., 2020). In this new era, politicians and pundits are trying to justify new nationalist economic proposals, but they ignore a vast repository of academic analyses and contemporaneous reporting which show that American trade protectionism—even in the periods most often cited as "successes"—not only has imposed immense economic costs on American consumers and the broader economy, but also has failed to achieve its primary policy aims and fostered political disfunction along the way (Lincicome, 2017). In this paper we investigate the short-run impacts of protectionism on Mexico, a country that was not the starter of the protectionism policies but certainly affected by them. We are specifically interested to see the empirical impacts of the imposition of tariffs on trade between the U.S. and Mexico. To answer this question first we use event studies to see the impact of changes in trade policies between these two countries for the period of 2016-2019. Second, we apply Zoutman et al. (2018) approach to estimate the trade elasticities. Following the works of Fajgelbaum et al. (2020) we estimate Mexico's variety, product and aggregate imports and exports elasticities by using the six-digit level of the Harmonized System. We find that estimated elasticities of Mexico's imports demand and exports supply are -1.08 and 0.44 respectively. Third, we use a small open economy DSGE model developed by Christiano et al. (2011), to study the impacts of different bilateral trade shocks between the U.S and Mexico's economy on aggregate macroeconomic variables considering different scenarios like retaliations. Our result shows that in the short run, the imposition of 10 percent tariffs on Mexico's exports potentially may reduce the Mexico's GDP by more than 4 percent. It will also reduce exports, nominal and real exchange rate. We find that 10 percent retaliatory tariffs on Mexico's imported consumption goods may decrease consumption by less than 2 percent. Investment and exports will decrease as well, and there are inflationary effects on price variables. CPI inflation increases by less than 5 percent.

The rest of the paper is organized as follows: in section 2, we will review the related studies and provide some backgrounds on Mexico's international trade. In section 3, we will present the summary of methodology and data used in the paper. The results are presented in section 4, and we will conclude the paper in section 5.

2 Background

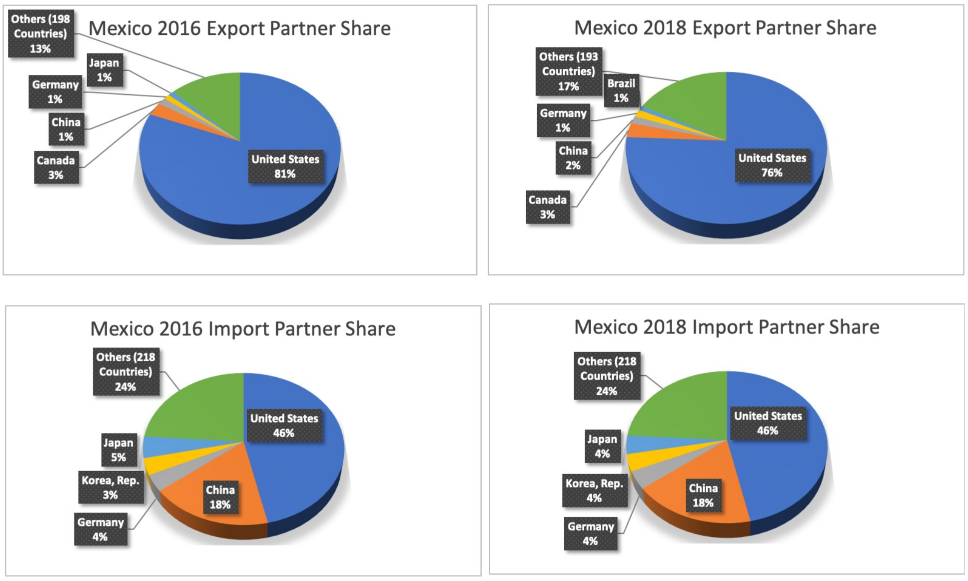
In this section first we review some related studies and then we provide general backgrounds about the Mexico's economy with focus on international trade.

There is a body of literature investigating the impacts of tariff increases on U.S. economy (Fajgelbaum et al., 2020; Li & Whalley, 2020; Amiti et al., 2019Mattoo & Staiger, 2019;Hortacsu et al., 2019; Amiti et al., 2020), protectionism and Brexit in the U.K. (Steinberg, 2019; Kee & Nicita, 2017), and trade war between U.S. and China (Cavallo et al., 2019; Egger & Zhu, 2019; Fontagné & Bellora, 2019; Auray et al., 2020; Freund et al., 2020). However, studies that examine the impacts of this new wave of protectionism on other emerging economies such as Mexico are absent in the literature. Our goal is to fill in this gap.

Amiti et al. (2020) used event study approach to analyze whether tariffs levied by a large country, such as the United States, would cause foreign firms to lower prices. They found that U.S. tariffs continue to be almost entirely borne by U.S. firms and consumers. Similarly, they also found that the substantial redirection of trade in response to the 2018 tariffs has accelerated. Among goods that continued to be imported, a 10 percent tariff was associated with about a 10 percent drop in imports for the first three months, but this elasticity doubles in magnitude in subsequent months.

Fajgelbaum et al. (2020) analyzed the impacts of U.S. protectionism on U.S. economy in 2018 and found import and retaliatory tariffs caused large declines in both imports and exports. They estimated a U.S. demand system that accommodates reallocations across imported varieties, imported products and between imported and domestic products within a sector. Estimated elasticities of substitution across origins (i.e., varieties) within a product, across imported products, and between domestic goods and imports within a sector are 2.53, 1.53, and 1.19,

Figure 1: Mexico's Trade Partner Share



Source: World Bank Data Set (WITS, 2020).

respectively. Their results support imports of varieties targeted by U.S. tariffs fell on average 31.7%; imports of targeted products fell 2.5%; and imports in targeted sectors fell 0.2%. On the export side, they found that retaliatory tariffs resulted in a 9.9% decline in U.S. exports within products. They estimated a roughly unitary elastic foreign demand for U.S. varieties (1.04), and complete pass-through of retaliatory tariffs to foreign consumers.

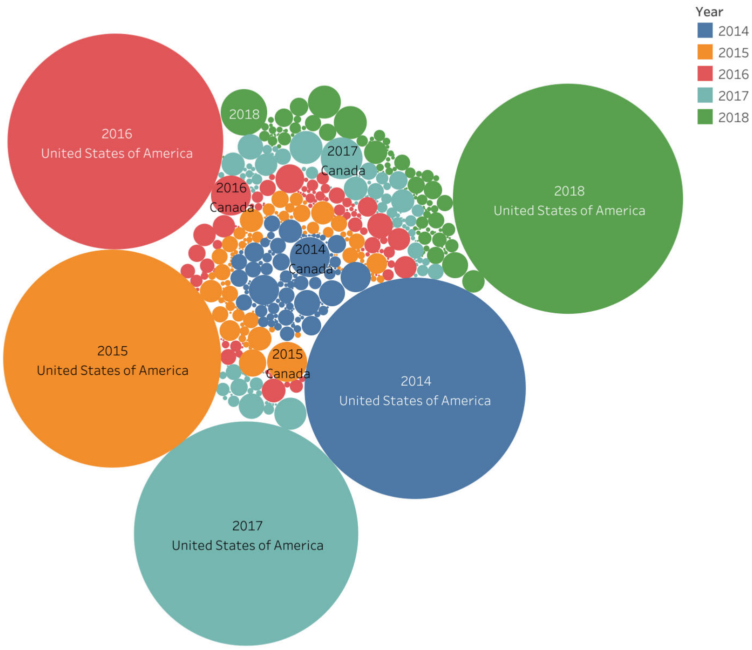
Cavallo et al. (2019) used data collected at the border and at retailers to characterize the impact of changes in U.S. trade policy — particularly the tariffs placed on imports from China — on importers, consumers, and exporters. Their results support that at the border, import tariff pass-through is much higher than exchange rate pass-through. Chinese exporters did not lower their dollar prices by much, despite the appreciation of the dollar. By contrast, U.S. exporters significantly lowered prices affected by foreign retaliatory tariffs. In U.S. stores, the price impact is more limited, suggesting that retail margins have fallen. Their results imply that, the tariffs' incidence has fallen in large part on U.S. firms.

In terms of methodology, our paper is in line with Fajgelbaum et al. (2020) and Amiti et al. (2020). However, it differs from these studies by using a comprehensive DSGE model in addition to other tools. Next, some general backgrounds about the Mexico's international trade are provided.

Figure 1 compares Mexico's trade partners between 2016 and 2018[1]. The top two panels show

[1] Data from World Bank Data set (WITS, 2020). Data for 2019 and 2020 is not yet available

Figure 2: Mexico's Export Partner Share (2014-2018)



Source: UN COMTRADE Database 2020

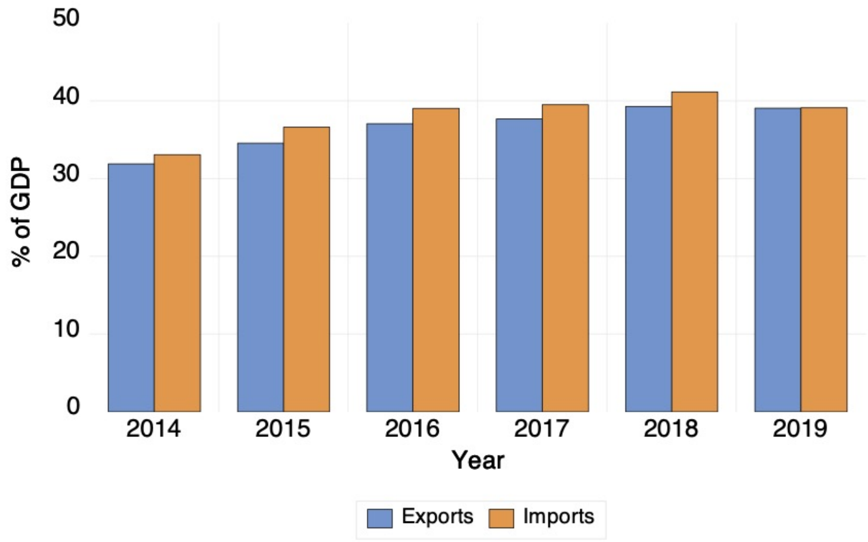
Mexico's exports partners and bottom panels illustrate Mexico's imports partners. In 2016 (top left panel) share of U.S. in Mexico's exports is 81% which is not comparable with other trade partners. Even if we consider Mexico's exports to Europe and Central Asia combined, it doesn't count more than 5.51%. Any change in U.S trade policy can shake Mexico's export and accordingly the economy so bad[2]. This explains the importance of studying the impacts of U.S. protectionism on Mexico. Share of U.S. in Mexico's exports decreases to 79.95% in 2017 and 76.49% in 2018. This shows a small substitution of U.S. share with other trade partners. For imports (bottom panels), there is not a significant change in Mexico's partners. U.S. share, which is 46.48% in 2016, declines slightly in 2017 to 46.39% and again increases to 46.59% in 2018. Also, while for South Korea import share increases from 3.52% to 3.60% between 2016 and 2018, this share drops from 4.59% to 3.92% for Japan.

Figure 2 shows the changes in Mexico's export partners between 2014 and 2018. U.S. remains the largest Mexico's export partner in all these years. Canada is the second largest partner with a substantial difference to the U.S. Figure 10 in Appendix A shows other Mexico's export partners in details.

Figure 3 shows the importance of exports and imports for Mexico. Blue bars illustrate Mexico's

[2]Export is substantial part of Mexico's GDP. In 2016 it was 37% of Mexico's GDP (See figure 3).

Figure 3: Mexico's Exports and Imports (2014-2019, % GDP)



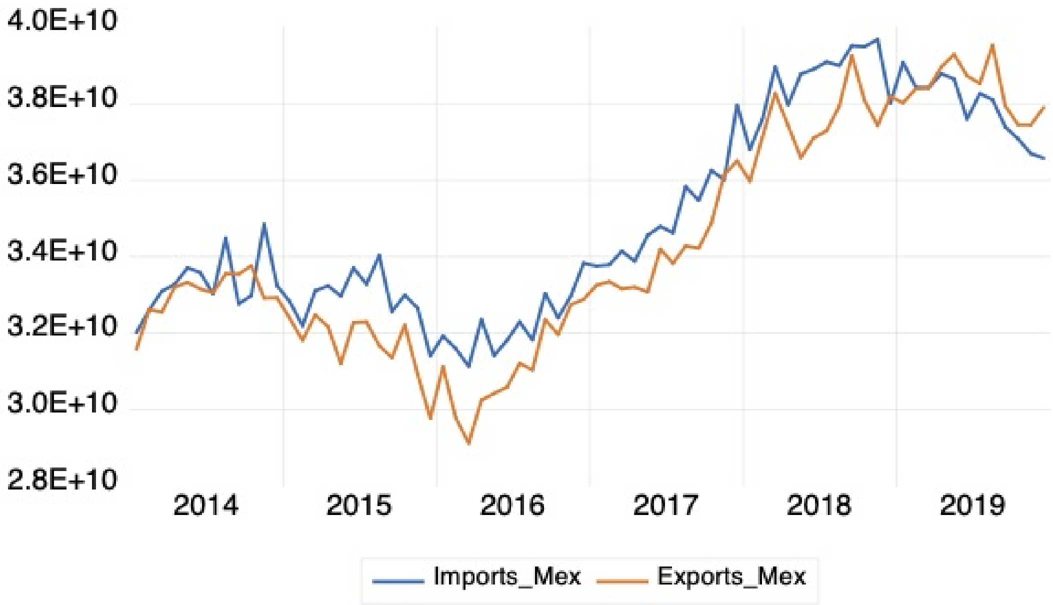
Source: World Development Indicators (WDI, 2020)

exports and brown bars shows Mexico's imports as percentage of GDP between 2014 and 2019. Mexico's exports increase from 31.89 to 39.06 percent during these years, making the country a member of high-exporters club such as Germany and South Korea. Meanwhile Mexico's imports rise from 33.07 to 39.11 percent. So, if there is a concern for international trade in a country like U.S. with exports/GDP ratio around 13 percent, any distortion in international trade should be much more important for the members of this club such as Mexico.

Figure 4 shows the seasonally adjusted monthly value of Mexico's exports and imports in U.S. dollars for the period of 2014-2019. Both Mexico's imports and exports decrease between 2015-2016 and from the middle of 2016 they start to increase.[3] This increase continues to the end of 2018. Beginning of 2019 both exports and imports start to decline again. Most of the protectionism and imposition of tariffs on targeted items between U.S. and Mexico happened in 2018. Despite this, the upward trends of exports and imports continued to the end of 2018. Figure 5 illustrates U.S. exports and imports to Mexico since 1985. After signing NAFTA, in 1994 U.S. trade deficit with Mexico has started and got larger over the years. In 2016 this trade deficit is 63,271.6 million dollars and in 2019 increased to 101,400.6 million dollars.

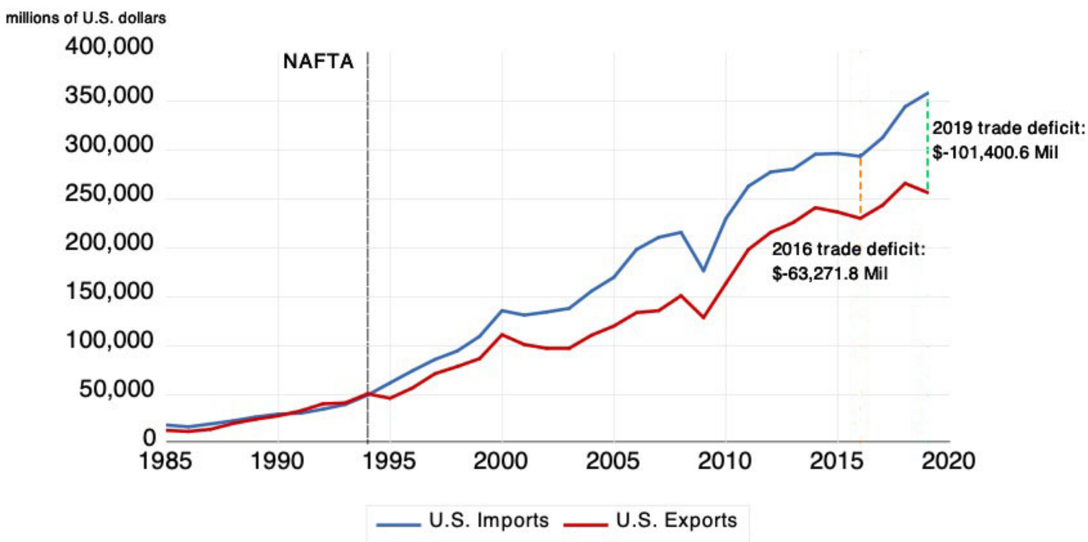
[3]Comparing the changes in oil price with fluctuations of Mexico's exports and imports (specially exports), suggests a positive correlations between them. However, when we excluded oil, still the trends remain.(See Figure 11 in Appendix A)

Figure 4: Mexico's Exports and Imports in U.S. Dollars (2014-2019)



Source: Federal Reserve Economic Data (FRED), 2020

Figure 5: U.S. Exports and Imports to Mexico (1985-2019)



Source: UN COMTRADE Database 2020

3 Methods and Data

This section describes the data and the framework used for event studies, estimation of different trade elasticities for Mexico, and imports/exports sections of the DSGE model used to study the effects of U.S. tariffs on Mexico's economy through bilateral trade shocks.

3.1 Data

For Mexico's trade value and quantity, we use monthly UN COMTRADE data at the HS6 products levels for the period of 2016-2019. For Mexico's tariffs, we use the annual WTO database of Most Favored Nation (MFN) tariff rates and compute the tariff rate for each country-product as the average of the MFN rate. These tariffs are entirely ad valorem. For U.S. tariffs we use Fajgelbaum et al. (2020) database which includes a monthly panel of U.S. statutory import tariffs and is constructed by using public schedules from the U.S. International Trade Commission (USITC). For the rest of the variables we use Banco de México and National Institute of Statistics and Geography (INEGI) databases.

3.2 Event Studies

Following Fajgelbaum et al. (2020) and Amiti et al. (2020), we use an event study framework to assess the impact of tariffs on trade between US. and Mexico. We compare the trends of targeted varieties to varieties not targeted in the following specification:

$$\ln y_{igt} = \alpha_{ig} + \alpha_{gt} + \alpha_{it} + \sum_{j=-6}^{6} \beta_{0j} I(event_{igt} = j) + \sum_{j=-6}^{6} \beta_{1j} I(event_{igt} = j) \times target_{ig} + \epsilon_{igt}$$

This specification includes country-product (varieties) α_{ig}, country-time α_{it}, and product-month α_{gt} fixed effects for Mexico's imports and exports, y_{igt}. Varieties targeted by tariffs are captured by the $target_{ig}$ dummy. We assign the event date of targeted varieties to be the nearest full month to the actual event date, using the 15^{th} of the month as the cutoff date. We use HS-6 because that is the finest level at which product codes are comparable across countries. We plot the β_{1j} dummies that capture the relative trends of targeted varieties.

3.3 Trade Elasticities

In this section, we present the framework used to estimate Mexico import and foreign export variety elasticities, product elasticities, import elasticities between domestic and imported products, and foreign import and Mexico export variety elasticities following Zoutman et al. (2018) and Fajgelbaum et al. (2020) approach.

3.3.1 Mexico Import and Foreign Export Variety Elasticities (σ, ω^*)

We estimate the import demand and export supply variety elasticities simultaneously. The strategy of identifying two elasticities with one instrument was applied by Romalis (2007) and Zoutman et al. (2018). Intuitively, tariffs create a wedge between what the importer pays and what the exporter receives. A tariff shifts down the demand curve for any given price received by the exporter, tracing the supply curve. Similarly, a tariff shifts up the supply curve for any given price paid by the consumer, tracing the demand curve. Hence, data on changes in prices, tariffs, and quantities is sufficient to trace both the demand and supply curves simultaneously (Fajgelbaum et al., 2020). We can use specifications (1), (2) to estimate these elasticities:[4]

$$\Delta \ln m_{igt} = \eta_{gt}^{m} + \eta_{it}^{m} + \eta_{is}^{m} - \sigma \Delta \ln p_{igt} + \epsilon_{igt}^{m} \tag{1}$$

$$\Delta \ln p_{igt}^{*} = \eta_{gt}^{p^*} + \eta_{it}^{p^*} + \eta_{is}^{p^*} - \omega^* \Delta \ln m_{igt} + \epsilon_{igt}^{p^*} \tag{2}$$

where, $y = \{P^*, m\}$, the η_{gt}^{y} are product-time fixed effects, the η_{it}^{y} are country-time fixed effects, and the η_{is}^{y} are country-sector fixed effects (s is the sector of product g).

3.3.2 Product Elasticity (η)

The elasticity η across products is identified by aggregating variety-specific tariffs to the product level. We can use specification (3) to find this elasticity

$$\Delta \ln s_{M_{gt}} = \psi_{st} + (1-\eta)\Delta \ln p_{M_{gt}} + \epsilon_{M_{gt}} \tag{3}$$

where $s_{M_{gt}} \equiv \frac{p_{M_{gt}} m_{gt}}{P_{M_{st}} M_{st}}$ is the import share of product g in sector s. The parameter $\psi_{st} \equiv -(1-\eta)\Delta \ln P_{M_{st}}$is a sector-time fixed effect that controls for the overall sector import price index, and $\epsilon_{M_{gt}}$ is a residual that captures the imported product demand shock.

[4]Details of specifications are provided in Appendix B

3.3.3 Import Elasticity (κ)

When we aggregate to the top tier within a sector, we can estimate the elasticity κ between domestic and imported products within sectors. The import expenditures $P_{M_{st}}M_{st}$, relative to the expenditures in domestically produced goods $P_{D_{st}}D_{st}$, are a function of the import price index $P_{M_{st}}$ relative to the price index of domestically produced goods $P_{D_{st}}$:

$$\Delta \ln(\frac{P_{M_{st}}M_{st}}{P_{D_{st}}D_{st}}) = \psi_s + \psi_t + (1-\kappa)\Delta \ln(\frac{P_{M_{gt}}}{P_{D_{gt}}}) + \epsilon_{st} \tag{4}$$

The fixed effects and residual components capture demand shocks.

3.3.4 Foreign Import and Mexico Export Variety Elasticities

Analogous to Mexico import elasticity we can use the following equation to estimate the foreign import demand and the Mexico exports elasticity when Mexico faces increase in U.S. tariffs. To calculate these elasticities, we use:

$$\Delta \ln x_{igt} = \eta^x_{gt} + \eta^x_{it} + \eta^x_{is} - \sigma^* \Delta \ln((1+\tau^*_{igt})p^X_{igt}) + \epsilon^x_{igt} \tag{5}$$

where η^x_{gt} is a product-time effect, η^x_{it} is a country-time effect and η^x_{is} is a country-sector effect. In this specification p^X_{igt} is the before-duty price observed in Mexico and τ^*_{igt} is the tariffs in the foreign country. We estimate the Mexico variety inverse export supply curve by using

$$\Delta \ln p^X_{igt} = \eta^p_{gt} + \eta^p_{it} + \eta^p_{is} + \omega \Delta \ln(x_{igt}) + \epsilon^x_{igt} \tag{6}$$

where ω is the inverse export supply elasticity to each destination from the Mexico, after controlling for the fixed effects.

3.4 DSGE Model

We modify Christiano et al. (2011) DSGE model by using the above estimated elasticities and defining bilateral trade shocks between U.S. and Mexico, then we calibrate the model for Mexico. Christiano's baseline model is complicated, so here we only present exports and imports sections of the model.

3.4.1 Exports

There is a total demand by foreigners for domestic exports, which takes on the following form:

$$X_t = \left(\frac{P_t^x}{P_t^*}\right)^{-\theta_f} Y_t^* \tag{7}$$

Here, P_t^* is the foreign currency price of foreign homogeneous goods and Y_t^* is foreign GDP. Also, P_t^x is and index of export prices. The goods, X_t, are produced by a representative, competitive foreign retailer firm using specialized inputs as follows:

$$X_t = \left[\int_0^1 X_{i,t}^{\frac{1}{\lambda_x}} d_i\right]^{\lambda_x} \tag{8}$$

where $X_{i,t}$, $i \in (0,1)$ are specialized intermediate goods for export good production. The retailer that produces X_t takes its output price, P_t^x, and its input prices, $P_{i,t}^x$ as given. Optimization leads to the following demand for specialized exports:

$$X_{i,t} = \left(\frac{P_{i,t}^x}{P_t^x}\right)^{\frac{-\lambda_x}{\lambda_x-1}} X_t \tag{9}$$

and for P_t^x

$$P_t^x = \left[\int_0^1 (P_{i,t}^x)^{\frac{1}{1-\lambda_x}} d_i\right]^{1-\lambda_x} \tag{10}$$

The i^{st} specialized export is produced by a monopolist using the following technology:

$$X_{i,t} = \left[\rho_x^{\frac{1}{\theta_x}} \left(X_{i,t}^m\right)^{\frac{\theta_x-1}{\theta_x}} + (1-\rho_x)^{\frac{1}{\theta_x}} \left(X_{i,t}^d\right)^{\frac{\theta_x-1}{\theta_x}}\right]^{\frac{\theta_x}{\theta_x-1}} \tag{11}$$

where $X_{i,t}^m$ and $X_{i,t}^d$ are the i^{th} exporter's use of the imported and domestically produced goods respectively. It can be shown that:

$$mc_t^x = \frac{\gamma_t^x R_t^x}{q_t p_t^c p_t^x} \left[\rho_x (p_t^{m,x})^{1-\theta_x} + (1-\rho_x)\right]^{\frac{1}{1-\theta_x}} \tag{12}$$

where mc_t^x is the real marginal cost of exported goods, and γ_t^x is the U.S. tariff shock on exported goods from Mexico, R_t^x is the interest rate on capital loans used for production of exported goods, q_t is the real exchange rate, p_t^c is the price of consumption good, p_t^x is the price of exported good and $p_t^{m,x}$ is the price of the homogeneous import good used for exports.

Aggregate demand for domestic inputs used for export production is:

$$X_t^d = \int_0^1 X_{i,t}^d d_i = \Big[\rho_x (p_t^{m,x})^{1-\theta_x} + (1-\rho_x)\Big]^{\frac{\theta_x}{1-\theta_x}} (1-\rho_x)\,(p_t^{\circ x})^{\frac{-\lambda_x}{\lambda_x - 1}}\,(p_t^x)^{-\theta_f}\, Y_t^* \tag{13}$$

where $p_t^{\circ x}$ is a measure of the price dispersion. We also require an expression for imported inputs for export production in terms of aggregates. Using a similar derivation as for X_t^d it can be shown to be:

$$X_t^m = \rho_x \left(\frac{\Big[\rho_x (p_t^{m,x})^{1-\theta_x} + (1-\rho_x)^{\frac{1}{1-\theta_x}}\Big]}{p_t^{m,x}} \right)^{\theta_x} (p_t^{\circ x})^{\frac{-\lambda_x}{\lambda_x - 1}}\,(p_t^x)^{-\theta_f}\, Y_t^* \tag{14}$$

3.4.2 Imports

Foreign firms sell a homogeneous good to domestic importers. There are three types of importing firms: (i) one which produces goods used to produce an intermediate good for the production of consumption, (ii) one which produces goods used to produce an intermediate good for the production of investment, and (iii) one which produces goods used to produce an intermediate good for the production of exports. The production function of the domestic retailer of imported consumption goods is:

$$C_t^m = \left[\int_0^1 (C_{i,t}^m)^{\frac{1}{\lambda_{m,c}}}\, di\right]^{\lambda_{m,c}} \tag{15}$$

where $C_{i,t}^m$ is the output of the i^{th} specialized producer and C_t^m is an intermediate good used in the production of consumption goods. The domestic retailer is competitive and takes $P_t^{m,c}$, which is the price index of C_t^m, and $P_{i,t}^{m,c}$, which denotes the price of the i^{th} intermediate input as given. The demand curve for specialized inputs is given by the domestic retailer's first order necessary condition for profit maximization:

$$C_{i,t}^m = C_t^m \left(\frac{P_t^{m,c}}{P_{i,t}^{m,c}}\right)^{\frac{\lambda_{m,c}}{\lambda_{m,c}-1}} \tag{16}$$

The producer of $C_{i,t}^m$, buys the homogeneous foreign good and converts it one-for-one into the domestic differentiated good, $C_{i,t}^m$ but now has to pay for the retaliatory tariffs $\gamma_t^{m,c}$. The intermediate good producer's marginal cost is:

$$mc_t^{m,c} = \gamma_t^{m,c} S_t P_t^* R_t^* \tag{17}$$

where R_t^* is the foreign nominal rate of interest, S_t is the nominal exchange rate and P_t^* is the foreign price index.

Similarly, the production function for the domestic retailer of imported investment goods, I_t^m is

$$I_t^m = \left[\int_0^1 \left(I_{i,t}^m \right)^{\frac{1}{\lambda_{m,i}}} di \right]^{\lambda_{m,i}} \tag{18}$$

and finally, for the domestic retailer of imported goods used in the production of an input, X_t^m, for the production of export goods is:

$$X_t^m = \left[\int_0^1 \left(X_{i,t}^m \right)^{\frac{1}{\lambda_{m,x}}} di \right]^{\lambda_{m,x}} \tag{19}$$

4 Results

First, we start with the results of event studies. Figure 6 shows the impacts on imported varieties. The top two panels report the impact of tariffs on import values and quantities, and the bottom panels show the effects on unit values, both exclusive and inclusive of duties. It seems that for both import value and quantity Mexico importers anticipated the tariff changes before the impact occurs in the market and they reduced import values and quantities by more than 20 percent on average. In the bottom-left panel, before duty unit values do not change. However, duty-inclusive unit values increase sharply to more than 10 percent for targeted varieties. These two panels provide initial evidence of complete pass-through of the tariffs to import prices at the variety level.

Figure 7 reports the impacts of the U.S. tariffs on Mexico's exports. It seems that again Mexico's exporters anticipated the U.S. tariffs and reduced the export values before tariffs hit the market. The impact of U.S. tariffs on targeted varieties of Mexico seems to be relatively small and lasts for a short time for both export values and quantities. They both increase after five to six months. The patterns for unit values both exclusive and inclusive of duties are similar to what we observe for imports. Duty-inclusive unit values increase sharply for targeted varieties which shows complete pass-through of the tariffs to import prices at the variety level.

One of threats of identification of elasticities is the pre-existing trends in data. Basically, tariff changes must be uncorrelated with import demand and export supply shocks. Since the event studies cannot clearly address this threat to identification, here we assess concerns about pre-

Figure 6: Variety Event Study-Imports

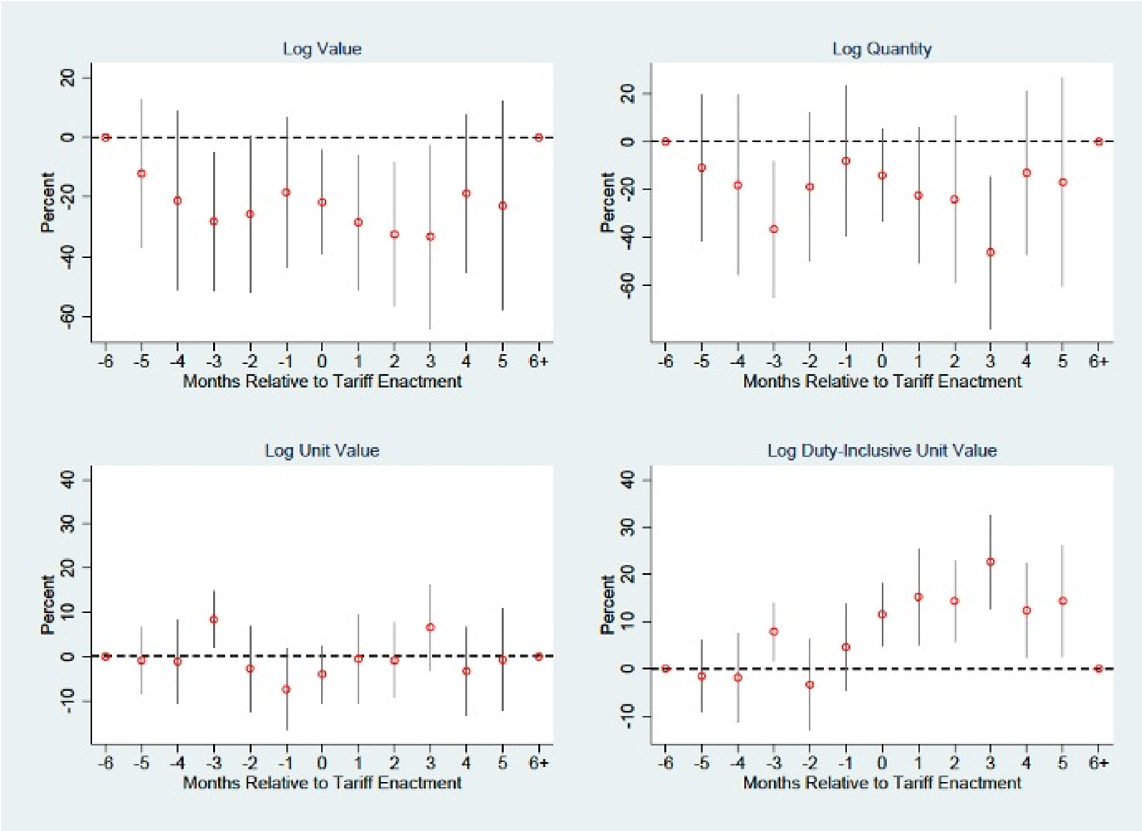
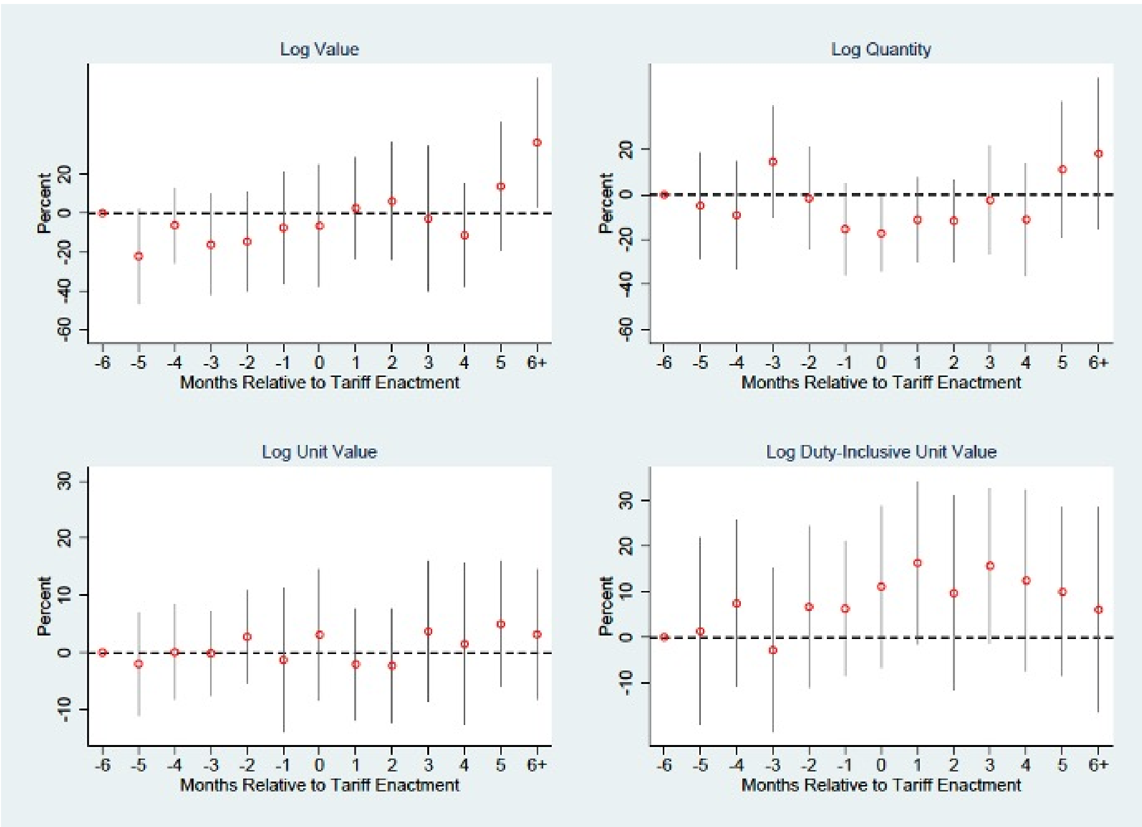


Figure 7: Variety Event Study-Exports



trends by correlating import and export outcomes before the 2018 trade war—values, quantities, unit values, and duty-inclusive unit values—with the subsequent tariff changes. We compute these outcomes as the average monthly change in 2017 and regress them against the changes in the import tariff rates between 2017 and 2018 (Fajgelbaum et al., 2020):

$$\overline{\Delta \ln y_{ig,2017}} = \alpha_g + \alpha_{is} + \beta\Delta \ln(1 + \tau_{ig}) + \epsilon_{ig}$$

These regressions control for HS6 product, α_g and country-sector α_{is} fixed effects. Panel A of table 1 shows the pre-trend tests for imports and Panel B shows the pre-trend tests for exports in values, quantities, unit values, and duty-inclusive unit values. We do not observe any statistically significant relationship across import/export outcomes, suggesting that targeted varieties are not on differential trends prior to the trade war. So, pre-trends should not be a threat to identification of elasticities. These results are in line with Fajgelbaum et al. (2020) results.

Table 1: Panel A, Mexico Import Trends

	(1)	(2)	(3)	(4)
	$\Delta \ln p^*_{ig} m_{ig}$	$\Delta \ln m_{ig}$	$\Delta \ln p^*_{ig}$	$\Delta \ln p_{ig}$
$\Delta_{17-18} \ln(1 + \tau_{ig})$	0.54	0.59	-0.20	-0.20
	(0.42)	(0.37)	(0.18)	(0.18)
Country×Sector FE	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes
R2	0.17	0.18	0.17	0.17
N	59,642	53,999	53,999	53,999
Panel B: Mexico Export Trends				
	(1)	(2)	(3)	(4)
	$\Delta \ln p^X_{ig} x_{ig}$	$\Delta \ln x_{ig}$	$\Delta \ln p^X_{ig}$	$\Delta \ln p^X_{ig}(1 + \tau^*_{ig})$
$\Delta_{17-18} \ln(1 + \tau^*_{ig})$	-0.22	0.45	0.16	-0.24
	(0.20)	(0.39)	(0.18)	(0.16)
Country×Sector FE	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes
R2	0.20	0.20	0.20	0.24
N	27,279	31,651	31,651	20,433

Table 2 illustrates Mexico's elasticity of variety import demand and foreign export supply. Columns 1-4 reports the responses of Mexico's import values, quantities, unit values, and duty-inclusive unit values to the tariff changes. Each specification is run in first-differences and includes fixed effects for product-time, country-time and country-sector. Column 1 and 2 shows that import values drop when tariff increases. Column 3 which is not statistically significant, indicates no impact of tariff increases on before-duty unit values and suggests a complete pass-through of tariffs to duty-inclusive import prices. Column 4 shows duty-inclusive unit values increases sharply when tariff increases. Column 5 reports the supply curve elasticity $\widehat{\omega}^* = 0.03$ which is not statistically significant. Column 6 reports Mexico's import demand elasticity $\widehat{\sigma} = -1.08$ and is statistically significant.

Table 2: Variety Import Demand (σ) and Foreign Export Supply (ω^*)

	(1)	(2)	(3)	(4)	(5)	(6)
	$\Delta \ln p^*_{igt} m_{igt}$	$\Delta \ln m_{igt}$	$\Delta \ln p^*_{igt}$	$\Delta \ln p_{igt}$	$\Delta \ln p^*_{igt}$	$\Delta \ln m_{igt}$
$\Delta \ln(1+\tau_{ig})$	-0.10^*	-0.09^*	0.00	1.00^{***}		
	(0.06)	(0.04)	(0.02)	(0.02)		
$\Delta \ln m_{igt}$					0.03	
					(0.21)	
$\Delta \ln p_{igt}$						-1.08***
						(0.07)
Product×Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Country×Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Country×Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
1^{st}-Stage F					1.3	3935
R2	0.14	0.15	0.14	0.14	.	0.03
N	1,634,733	1,147,069	1,147,069	1,147,069	1,147,069	1,147,069

Note: Significance Levels, *** .01; ** 0.05; * 0.10.

Table 3 shows estimates of the product elasticity, η. First, we construct the price index, $\Delta \ln p_{M_{gt}}$, and the instrument $\Delta \ln Z_{M_{gt}}$ by using the demand shocks from the import variety demand equation in column 6 of table 2 and $\widehat{\sigma}$=-1.08. Then we aggregate the import data to the product-time level, and regress the first differences of the product shares, $\ln s_{M_{gt}}$, and the duty-inclusive product-level price index, $\ln p_{M_{gt}}$ on the instruments while controlling for sector-time fixed effects. Column 1 is statistically significant and shows higher product-level tariffs lower the product import share. Column 2 indicates higher tariffs raise the product price index. Column 3 regress the change in product shares on the change in the instrumented price index, but it is not statistically significant. We also find η=0.09 but it is relatively small and statistically insignificant.

Table 3: Product Elasticity (η)

	(1)	(2)	(3)
	$\Delta \ln s_{M_{gt}}$	$\Delta \ln p_{M_{gt}}$	$\Delta \ln s_{M_{gt}}$
$\Delta \ln Z_{M_{gt}}$	-0.74^{***}	0.81^{***}	
	(0.32)	(0.34)	
$\Delta \ln p_{M_{gt}}$			-0.91
			(0.83)
Sector-Time FE	Yes	Yes	Yes
1^{st}-Stage F			2.2
$\hat{\eta}\,(se[\hat{\eta}])$			0.09 (0.83)
R2	0.10	0.03	.
N	85,617	85,617	85,617

Note: Significance Levels, *** .01; ** 0.05; * 0.10.

Table 4 reports the sector elasticity, κ for Mexico when we control for the sector and time fixed effects. To estimate sector elasticity, we need data on changes of imports and domestic expenditures at the sectoral level. We use the change in Mexico's producer price index (PPI) as a proxy for $\Delta \ln P_{D_{st}}$. Also, since the data for $\Delta \ln P_{D_{st}} D_{st}$ is not available we use Mexico's monthly industrial activity indicator which is at the sectoral level to construct it. Column 1 which is not statistically significant shows the regression of relative imports to domestic expenditure on the instrument. Column 2 indicates the increase in the instrument has a positive impact on the relative price of imported good to PPI and this impact is sharp. However, it is statistically insignificant. Column 3 reports the relationship between the relative imports to domestic expenditure and relative prices is not statistically significant. It also suggests increase in relative prices will decrease the relative imports to domestic expenditure. $\hat{\kappa} = 0.64$ and is noisy.

Table 4: Sector Elasticity (κ)

	(1) $\Delta \ln \left(\frac{P_{M_{st}} M_{st}}{P_{D_{st}} D_{st}}\right)$	(2) $\Delta \ln \left(\frac{P_{M_{st}}}{p_{st}}\right)$	(3) $\Delta \ln \left(\frac{P_{M_{st}} M_{st}}{P_{D_{st}} D_{st}}\right)$
$\Delta \ln Z_{M_{st}}$	-4.92	13.51	
	(4.96)	(15.32)	
$\Delta \ln \left(\frac{P_{M_{st}}}{p_{st}}\right)$			-0.36
			(0.73)
Sector FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
1^{st}-Stage F			0.8
$\hat{\kappa}\,(se[\hat{\kappa}])$			0.64 (0.73)
R2	0.9	0.1	.
N	2,018	2,018	2,018

Note: Significance Levels, *** .01; ** 0.05; * 0.10.

Table 5 illustrates Mexico's elasticity of variety export supply and foreign import demand. Columns 1-4 reports the responses of Mexico's export values, quantities, unit values, and duty-inclusive unit values to the tariff changes. Each specification is run in first-differences and includes fixed effects for product-time, country-time and country-sector. We observe a statistically significant increase in both export values and quantities suggesting U.S tariffs could not reduce the exports values and quantity of exports. In column 3 we find no evidence that the U.S. tariffs caused Mexico's exporters to lower duty-excusive product level unit values. Column 4 shows that the duty-inclusive export prices rise with increase in tariffs. Column 5 estimates Mexico's export supply curve at the variety level and we find $\widehat{\omega} = 0.44$. Finally, column 6 estimates the foreign import demand which is $\widehat{\sigma}^* = -0.91$ and is statistically significant.

Table 5: Foreign Import Demand (σ^*)

	(1)	(2)	(3)	(4)	(5)	(6)
	$\Delta \ln p^X_{igt} x_{igt}$	$\Delta \ln x_{igt}$	$\Delta \ln p^X_{igt}$	$\Delta \ln p^X_{igt}(1+\tau^*_{igt})$	$\Delta \ln p^X_{igt}$	$\Delta \ln x_{igt}$
$\Delta \ln(1+\tau^*_{igt})$	0.59^{***}	1.1^{***}	0.26	1.07^{***}		
	(0.18)	(0.43)	(0.33)	(0.34)		
$\Delta \ln x_{igt}$					0.44^{***}	
					(0.15)	
$\Delta \ln p^X_{igt}(1+\tau^*_{igt})$						-0.91^{***}
						(0.29)
Product×Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Country×Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Country×Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
1^{st}-Stage F					0.7	1.7
R2	0.11	0.13	0.12	0.12	0.39	.
N	329,488	233,433	233,433	301,980	233,433	221,355

Note: Significance Levels, *** .01; ** 0.05; * 0.10.

In this subsection, we report the results of Christiano et al. (2011) DSGE model calibrated for Mexico's economy. Figure 8 shows the Impulse Response Functions (IRFs) of U.S Tariff shocks on Mexico's Export. Potentially, the imposition of 10 percent tariffs on all exported goods from Mexico to U.S. can decline Mexico's GDP by less than 5 percent. This shock will increase consumption and investment slightly but has a large impact on Mexico's export. Both nominal and real exchange rate decreases. The impact on nominal exchange rate vanishes fast but for real exchange rate it fluctuates to positive values and stays positive after five periods. This shock will have a relatively small deflationary impact on inflation and CPI prices.

As it is shown in figure 9, potentially, if Mexico decided to impose 10 percent retaliatory tariffs on consumption goods imported to the country from U.S., the Mexico's consumption decreases around 2 percent. This shock will have a negative impact on Mexico's exports and a significant impact on investment. Unemployment increases by 4 percent. The shock has inflationary impact on price variables. CPI inflation increases to less than 5 percent. Inflation

Figure 8: Impulse Response Functions of U.S Tariff shocks on Mexico's Exports

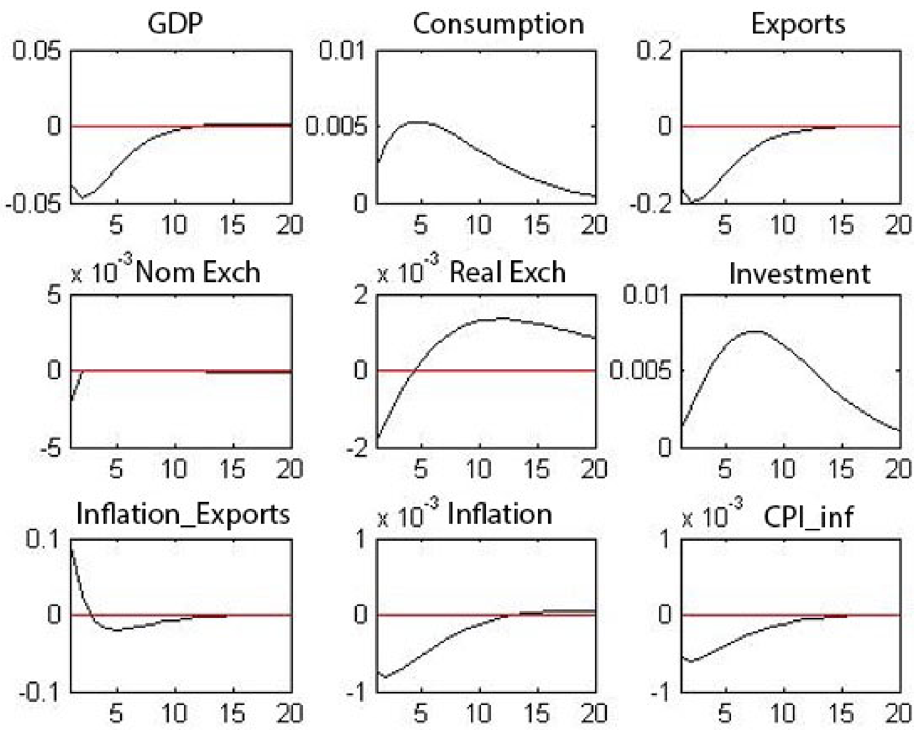
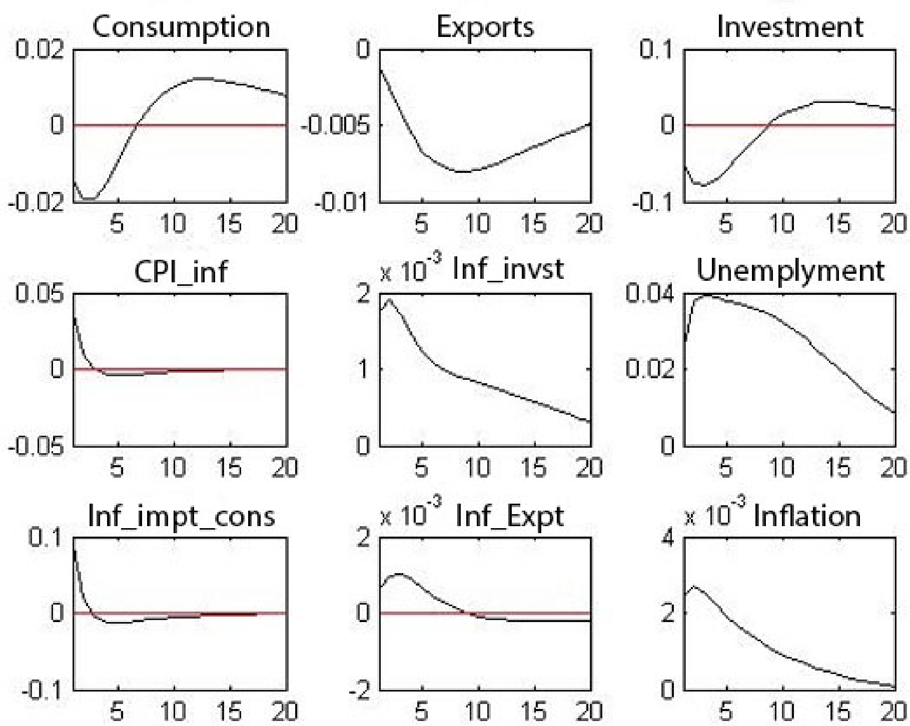


Figure 9: Impulse Response Functions of Mexico's Retaliatory Tariff shocks on Imported consumption goods



on investment goods and exported goods also increases.

5 Conclusion

This paper investigates the short-run impact of new wave of U.S. protectionism on Mexico's economy. We apply event studies approach to see the impact of changes in trade policies on Mexico's imports and exports for the period of 2016-2019. Our results show that the imposition of tariffs could not significantly reduce the trade values and quantities, but we could find a complete pass-through of the tariffs to imports and exports prices at the variety level. We also apply Fajgelbaum et al. (2020) approach to estimate Mexico import and foreign export variety elasticities, product elasticities, import elasticities between domestic and imported products, and foreign import and Mexico export variety elasticities. The estimated elasticities of Mexico's imports demand and exports supply are -1.08 and 0.44 respectively. We also modify Christiano et al. (2011) DSGE model by using the estimated elasticities and defining bilateral trade shocks between U.S. and Mexico. We calibrate the model for Mexico. Our results show that potentially, if there is a 10 percent tariffs on all exported goods from Mexico to U.S. Mexico's GDP reduces by less than 5 percent. This shock has a large impact on Mexico's export. Both nominal and real exchange rate decreases. And there will be a relatively small deflationary impact on inflation and CPI prices. Potentially, if Mexico decided to impose 10 percent retaliatory tariffs only on consumption goods imported from U.S., the Mexico's consumption decreases by 2 percent. This shock will have a negative impact on Mexico's exports and a significant impact on investment. Unemployment increases by 4 percent. And there will be inflationary impact on price variables. CPI inflation increases to less than 5 percent.

References

Amiti, M., Redding, S. J., & Weinstein, D. E. (2019). The impact of the 2018 tariffs on prices and welfare. Journal of Economic Perspectives, 33(4), 187–210.

Amiti, M., Redding, S. J., & Weinstein, D. E. (2020). Who's paying for the us tariffs? a longer-term perspective. In AEA papers and proceedings (Vol. 110, pp. 541–46).

Auray, S., Devereux, M. B., & Eyquem, A. (2020). Trade wars, currency wars (Tech. Rep.). National Bureau of Economic Research.

Cavallo, A., Gopinath, G., Neiman, B., & Tang, J. (2019). Tariff passthrough at the border and at the store: evidence from us trade policy (Tech. Rep.). National Bureau of Economic Research.

Christiano, L. J., Trabandt, M., & Walentin, K. (2011). Introducing financial frictions and unemployment into a small open economy model. Journal of Economic Dynamics and Control, 35(12), 1999–2041.

Egger, P. H., & Zhu, J. (2019). The us-chinese trade war: An event study of stock-market responses.

Fajgelbaum, P. D., Goldberg, P. K., Kennedy, P. J., & Khandelwal, A. K. (2020). The return to protectionism. The Quarterly Journal of Economics, 135(1), 1–55.

Fontagné, L., & Bellora, C. (2019). Shooting oneself in the foot? trade war and global value chains.

Freund, C., Maliszewska, M., Mattoo, A., & Ruta, M. (2020). When elephants make peace: The impact of the china-us trade agreement on developing countries. The World Bank.

Hortacsu, A., Tintelnot, F., & Flaaen, A. (2019). The production, relocation, and price effects of us trade policy: The case of washing machines. University of Chicago, Becker Friedman Institute for Economics Working Paper(2019-61).

Kee, H. L., & Nicita, A. (2017). Short-term impact of brexit on the united kingdom's export of goods. The World Bank.

Li, C., & Whalley, J. (2020). Trade protectionism and us manufacturing employment. Economic Modelling.

Lincicome, S. (2017). Doomed to repeat it: The long history of america's protectionist failures. Cato Institute Policy Analysis(819).

Mattoo, A., & Staiger, R. W. (2019). Trade wars: What do they mean? why are they happening now? what are the costs? Economic Policy.

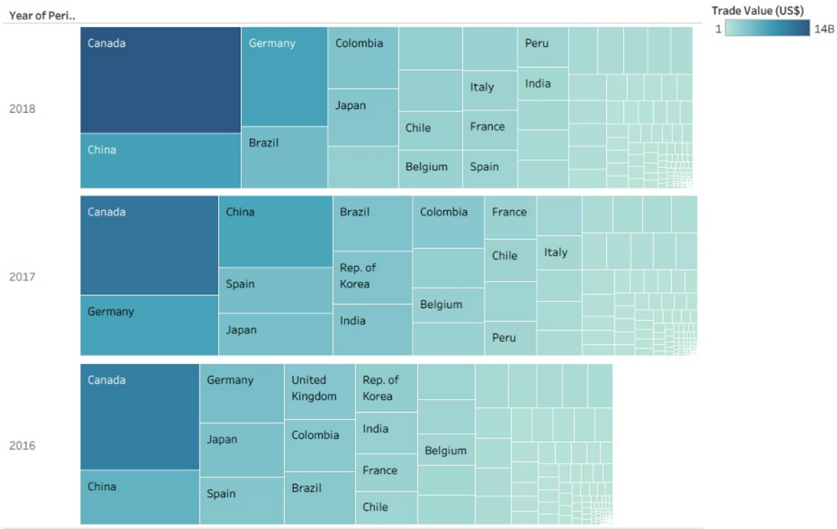
Romalis, J. (2007). NAFTA's and CUSFTA's impact on international trade. The review of Economics and Statistics, 89(3), 416–435.

Steinberg, J. B. (2019). Brexit and the macroeconomic impact of trade policy uncertainty. Journal of International Economics, 117, 175–195.

Zoutman, F. T., Gavrilova, E., & Hopland, A. O. (2018). Estimating both supply and demand elasticities using variation in a single tax rate. Econometrica, 86(2), 763–771.

Appendix A:

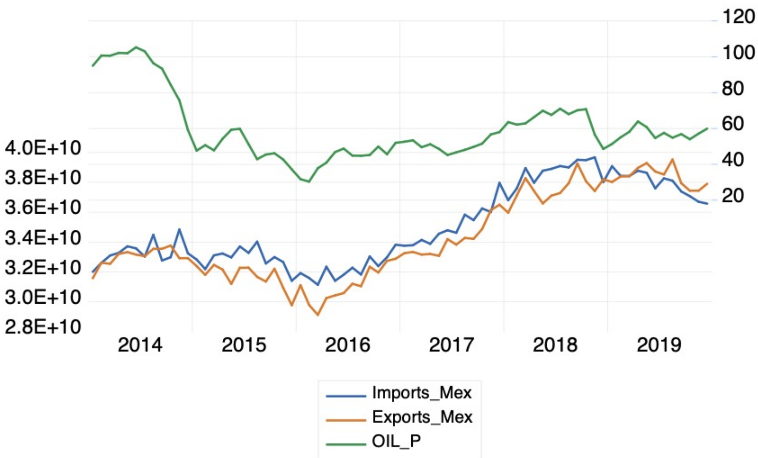
Figure 10: Mexico's Exports Partners Excluding the U.S. (2016-2018)



Source: UN COMTRADE Database 2020

This Figure shows Mexico's export partners excluding the U.S. between 2016 and 2018. Canada is the largest partner in all these years. Also, Germany, China and Japan are among the largest export partners of Mexico.

Figure 11: Mexico's Exports and Imports in U.S. Dollars Compared with Oil Price Changes (2014-2019)



Source: Federal Reserve Economic Data (FRED), 2020

Comparing the changes in oil price with fluctuations of Mexico's exports and imports (specially exports), suggests a positive correlations between them. However, when we excluded oil, still the trends remain.

Appendix B:

This section explains the details behind the specifications of trade elasticities (For more explanations see Fajgelbaum et al., 2020). There are S traded sectors. Within each traded sector, aggregate demand is structured according to a 3-tier CES demand system. In the upper nest there is differentiation between domestic and imported goods. Within each of these two nests of sector s there are G_s products. Within the nest of imported products, varieties are differentiated by country of origin known as country i. The value of imports in sector s is:

$$P_{M_s} M_s = E_s A_{M_s} \left(\frac{P_{M_s}}{P_s} \right)^{1-\kappa}$$

where E_s are aggregate expenditures in sector s, A_{M_s} is an import demand shock, P_{M_s} is the import price index, and P_s is the sector price index. The value of imports for product g in sector s is:

$$p_{M_g} m_g = P_{M_s} M_s a_{M_g} \left(\frac{p_{M_g}}{P_{M_s}} \right)^{1-\eta}$$

where a_{M_g} is an import demand shock and p_{M_g} is the import price index of product g. Finally, the quantity imported of product g's variety from country i is:

$$m_{ig} = m_g a_{ig} \left(\frac{p_{ig}}{p_{M_g}} \right)^{-\sigma}$$

where a_{ig} is a demand shock and p_{ig} is the domestic price of the variety ig. Domestic price based on the ad-valorem tariffs τ_{ig} and foreign price p^*_{ig} is:

$$p_{ig} = (1 + \tau_{ig}) p^*_{ig}$$

Accordingly, demand equations depend on three elasticities: across imported varieties within product (σ), across products (η), and between imports and domestic products within a sector (κ). (Fajgelbaum et al., 2020)