Junran Cao

Professor Nathan

PPPA-6014

9 May 2021

How Have the 2018 Trump Administration Tariffs Affected Domestic Price and Welfare? - A Conventional Framework

Introduction

The promise of President Trump to turn American trade policy in a trajectory more favorable to domestic producers raised barriers on US imports from countries around the globe.[i] As a result, throughout 2018, the Trump administration levied tariffs on over $300 billion US imports.[ii] Since the election of President Trump was a surprise to many US trade partners and affected industries, and the tariffs of the Trump administration are sufficient in scope and capacity to create observable influence across products, time, and countries, many economists have seen the 2018 US tariffs as a natural experiment to gauge the incidence of tariffs, that is, whether the amount of tariffs is passed through to consumers in the form of higher prices or absorbed by the foreign producer by lowering their export price.[iii] This paper first introduces the conventional framework for estimating the price and welfare effects of a tariff. Based on this framework, it then examines the price and welfare effects of the 2018 US tariffs. Finally, the paper reveals that the 2018 US tariffs had a complete pass-through effect on US producers and consumers.

Estimating the Economic Impacts of a Tariff - A Conventional Framework

Figure 1 illustrates the conventional framework for evaluating the effects of tariffs on prices and welfare. The horizontal axis depicts the quantity of imports (m), and the vertical axis depicts the price of the good (p). The import prices is denoted as (p), and the foreign exporter prices is denoted as (p*). D represents the import demand curve, and S* represents the export supply curve. Without tariffs, the market equilibrium price rests at (p*0 = p0). When price rises, the foreign export supply curve (S*) shifts up, reflecting that higher prices induce foreign producers to increase production and foreign consumers to decrease consumption. In contrast, the home import demand decreases, reflecting that higher prices induce domestic consumers to decrease demand and domestic firms increase production.

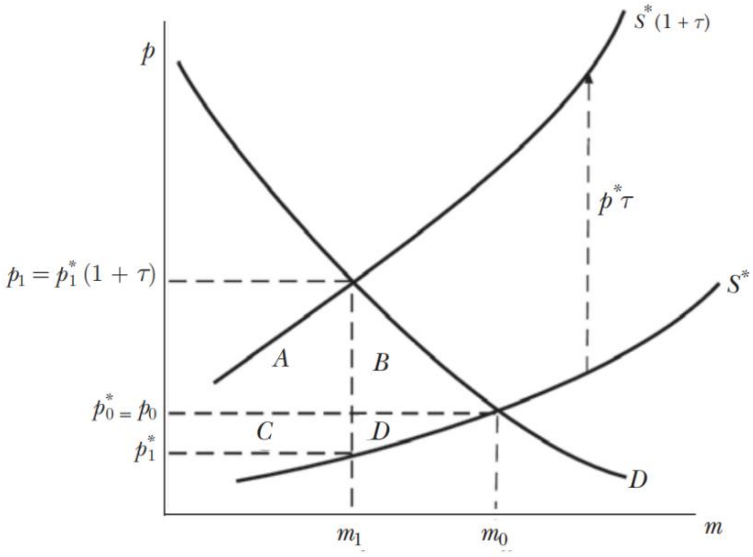

Figure 1[iv]

Note: * represents the foreign country.

A tariff of T on imports would raise the import prices in the domestic market from the price p0 (without tariff) to a new price p1*(1+T). Due to higher prices, domestic consumers decrease demand for imports from m0 to m1. At this level of import, there is a difference

between the prices charged by foreign exporters p*1 (1+T) and the prices paid by domestic consumers p*1, this difference equals the per-unit tariff collected p*T. The welfare loss to the home country is areas A + B. Area A represents higher import prices. Area B represents the deadweight loss, which is the reduction in real income caused by the distortion of domestic production and consumption decisions. The gain in tariff revenue to the home country is areas A + C. Since area A captures a transfer from domestic consumers to the government (i.e., higher price paid by domestic consumers to purchase imports), area C - B isolates the benefits of the tariff to the home country. Area C captures the gain to the home country derived from its ability to force foreign exporters to lower their price to continue entering the home market (i.e., the terms of trade of the home country). Noting that area C is also the producer surplus of the foreign country, it is, however, transferred to the home government in the form of tariff revenue, leaving area D, which is the deadweight loss to the foreign country from the distortion of its own production and consumption decisions.[v]

It is, however, important to note that when exports are perfectly elastic, generating a horizontal import supply curve, a tariff would have no impact on foreign prices, posing a loss to the home country instead.

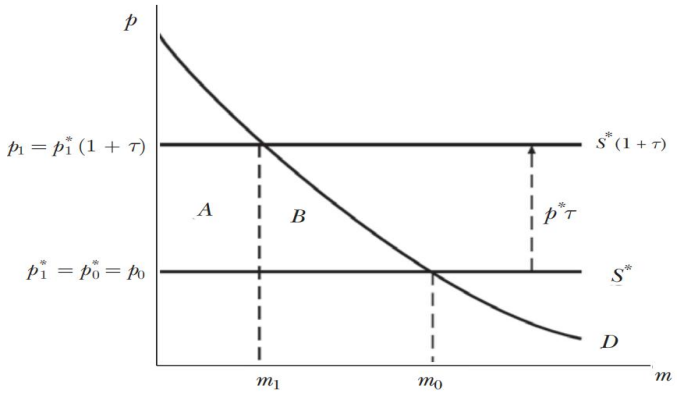

Figure 2[vi]

Note: * represents the foreign country.

In this case, as shown by Figure 2, the home country would suffer from a tariff because area C is eliminated, generating no gains from the terms of trade to the home country. Therefore, the home country is left with the deadweight loss (area B) due to the distortion of domestic production and consumption decisions.

This framework allows the deadweight loss (area B) generated by a tariff to be calculated. The height of area B is p*1(1+T) minus p0, and the base is m0-m1. The deadweight loss is therefore 2/1(p*1m1) ×T(m0-m1)/m1, where p*1m1 represents the value of imports after the tariff; T represents the tariff rate, and m0-m1/m1 represents the change in percentage of the quantity of imports due to the tariff.

Applying the Conventional Framework - How Have the 2018 Tariffs Affected Domestic Prices?

Over the course of 2018, US tariffs were introduced in six major waves. Starting in January, the first wave of tariffs imposed a duty of 30 percent on solar panels and 20–50 percent on washing machine imports. The second wave rolled out in March with a 10 percent tariff on aluminum imports and a 25 percent tariff on steel imports. Followed by three waves of tariffs on Chinese imports starting in July, a 25 percent tariff on $34 billion of Chinese imports began in July, another 25 percent tariff on another $16 billion of Chinese imports was imposed in August. Finally, a 10 percent tariff on an additional $200 billion of Chinese imports was imposed at the end of September. By October 2018, nearly 10.6 percent of US imports were facing tariffs, rising from 3.5 percent in December 2017.[vii]

To know how these tariffs have been passed into domestic prices, one can look at what has happened to the prices paid by US importers. Using the US customs data, Amiti et al

(2019). divided the import values by the import quantities to compute the unit values of US imports in 2018. They then multiplied the unit values by the tariff rates to calculate the tariff-inclusive import prices. As shown in Figure 3, the results showed a large increase in prices of imported goods that were subjected to tariffs, with unit values rising from 10 to 30 percent, suggesting an immediate, comprehensive pass-through effect of the tariffs. Also, as shown in Figure 4, import values saw a sharp decline after the imposition of the tariffs, falling an average of 25 to 30 percent.

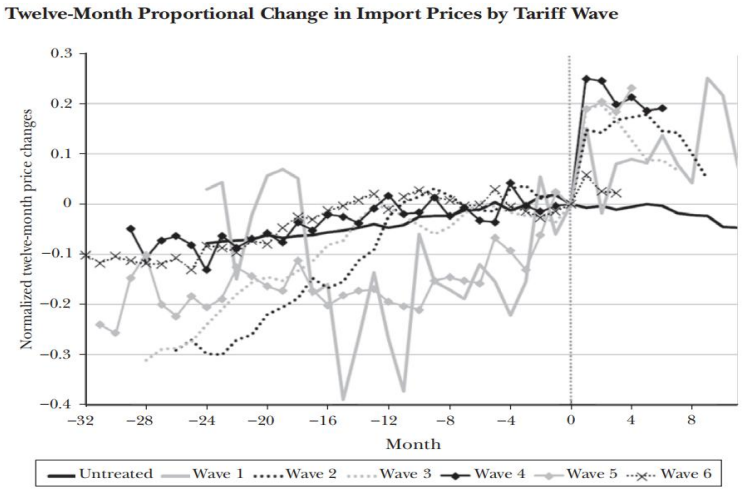

Figure 3[viii]

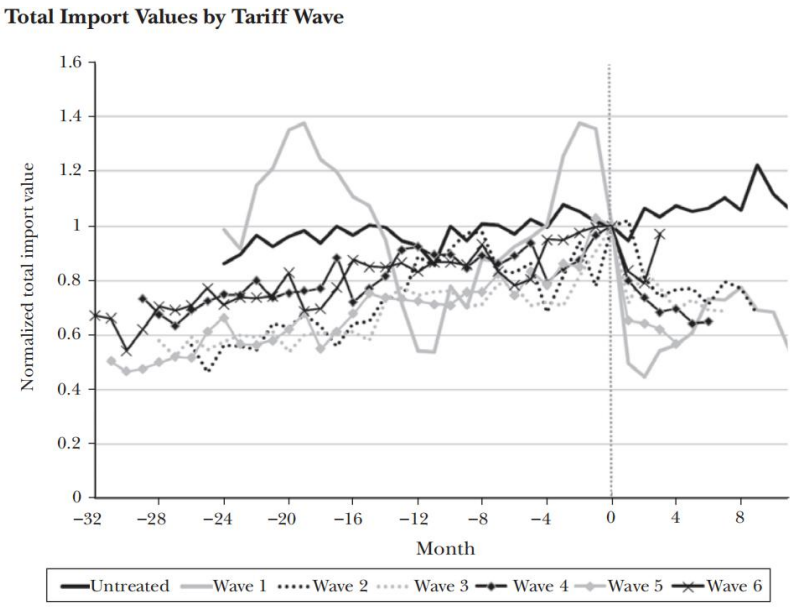

Figure 4[ix]

The conventional framework can also be expressed by regression as used by Aaron et al. to examine how the 2018 tariffs on Chinese washing machines have affected import prices.

$$\ln x_{ijt} = \eta_{ij} + \sum_{s=-\underline{T}}^{\overline{T}} \beta_s \left(\mathbb{I}_{ijs} \times \ln \left(\frac{1+\tau_{ijs}}{1+\tau_{ij0}} \right) \right) + \delta_{jt} + \mu_{it} + u_{ijt},$$

In this regression, (lnxijt) represents the logged tariff-inclusive import price; export country is represented as (i); HTS-10 (ten-digit Harmonized Tariff Schedule product code by country) is represented as (j); moth level is represented as (t). Also, expressed in an interaction term, the logged change in tariffs between the treatment months (s) and the last untreated month (ln[(1 + τijs)/(1 + $\tau ij0$)]) interact with the treatment month indicator variables (Iijs) to produce a change in the logged tariff-inclusive import price (lnxijt). Furthermore, the country-time fixed effect (μit) controls for time-varying factors that affected the prices of exports across all countries. The HTS10-time fixed effect (δjt) controls for time-varying factors that affected the exports of a product across all countries (e.g., exchange rates). The country-product fixed effect (ηij) controls for the level of import values or prices in the last untreated month, as well as the differences in product quality across all countries and products (e.g., breakthrough in production technology).[x] With a Difference-in-Difference technique, this regression captured the difference in import prices before and after the imposition of tariffs (policy time), and the difference in import price between the countries that were affected by the tariffs and the countries that were not (policy).

The findings suggested a significant pass-through effect to consumers, increasing the domestic prices of washing machines (i.e., washers and dryers) by nearly 100 percent, as shown in Figure 5.

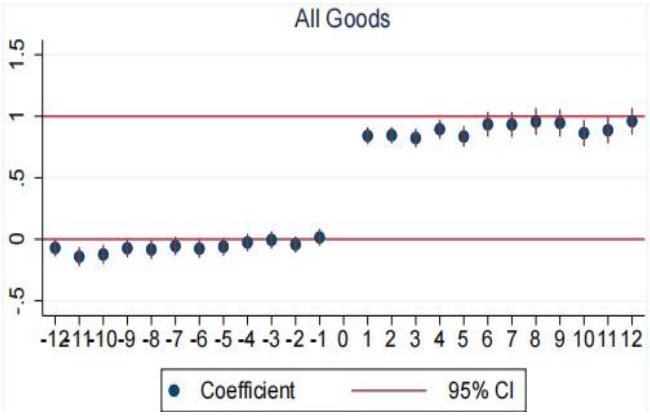

Figure 5[xi]

Note: There is an invisible line in the middle of the graph indicating the imposition of tariffs. The left side of the line would indicate the import prices before the tariffs (treatment), and the right side of the line would indicate the tariff-inclusive import prices. The dots shifting approximately from 0 to 1 can be interpreted as a 100 percent pass-through effect caused by the tariffs.

This complete and immediate pass-through effect revealed a lack of terms-of-trade effects. This might be caused by the general equilibrium effects, which allow supply and demand to interact and tend toward a balance in an economy of multiple markets working at once, creating a price equilibrium.[xii] It is also important to note that the prices charged by Chinese exporters for goods exported to the US (i.e., foreign prices) had not fallen significantly. According to the US import price index, between October 2017 and October 2019, the import prices from China fell only by 1.4 percent.[xiii] The slight decrease of foreign prices again suggested that terms-of-trade effects brought by the tariffs were minimal, and the elasticity of Chinese exports was close to perfectly elastic.

Applying the Conventional Framework - How Have the 2018 Tariffs Affected Welfare?

To estimate the welfare effect of a tariff, the conventional framework requires an estimation of foreign prices (i.e., how the price received by foreign exporters changes with an increase in tariff). Amiti et al (2020). used the monthly HTS10 country-level data for specific products imported from January 2017 to December 2018 to estimate a regression. Fixed effects at the product level and the country-month level were also included. As shown in Figure 6, what is being regressed here is the change in the logged import unit value (without tariff) over a twelve-month period on the logged change in one plus the applied tariff on imports over the same period.

Impact of US Tariffs on Importing

	log change foreign exporter prices (1)	*log change import quantities (2)*	*log change import quantities (3)*	*log change import values (4)*	*log change import values (5)*
	$\Delta \ln(p_{ijt})$	$\Delta \ln(m_{ijt})$	$\Delta \ln(m_{ijt})$	$\Delta \ln(p_{ijt} \times m_{ijt})$	$\Delta \ln(p_{ijt} \times m_{ijt})$
log change tariff $\Delta \ln(1 + Tariff_{ijt})$	−0.012 (0.023)	−1.310*** (0.090)	−5.890*** (0.590)	−1.424*** (0.086)	−6.364*** (0.773)
N	1,647,617	1,647,617	3,318,912	2,487,370	4,461,376
R^2	0.021	0.024	0.099	0.012	0.102

Figure 6[xiv]

As seen in column 1 of Figure 6, the coefficient -0.012 can be interpreted as: when the tariff increases by 1 percent, the prices charged by foreign exporters (i.e., foreign prices) decrease by 0.012 percent, holding all else constant. This finding suggested that the change in tariff had a minimal impact on foreign prices. Moreover, with a standard error of 0.023, the t-obtained is 0.52, which is less than the t-critical 1.96, failing to reject the alternative hypothesis that tariffs had a large impact on foreign prices. The results showed that in the short term, the supply elasticity of exports was close to perfectly elastic. As suggested by the

conventional framework, with a perfectly elastic export supply curve, the home country is left with zero terms-of-trade effects, making its consumers and firms bearing the deadweight loss.

Recalling the conventional framework, with the impact of the tariffs on prices and quantities shown in Figure 6, the deadweight loss (area B of Figure 7) from the tariffs can therefore be estimated using the formula DL = ½ ΔPΔM. The height of the triangle, which is the size of the tariff (Tp1*), is known. The width of the triangle, which is the quantity change in imports due to the tariff (m0 – m1), is shown in column 3 of Figure 6.

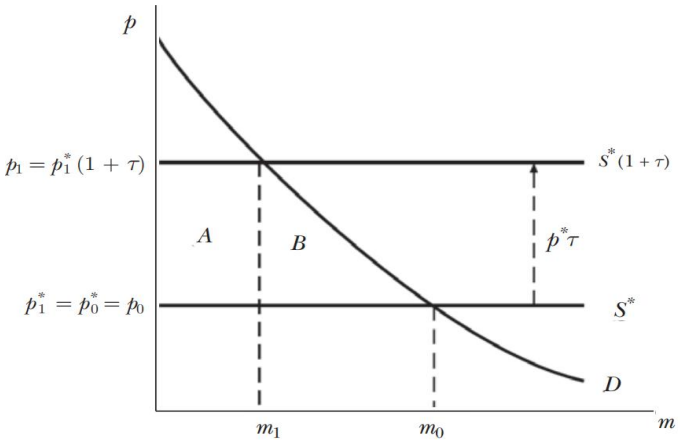

Figure 7[xv]

Deadweight Welfare Loss and Tariff Revenue
(current prices in billions of dollars)

Month (2018)	*Deadweight loss (1)*	*Tariff revenue (2)*	*Total cost to importers (3)*
January	0	0	0
February	0.1	0.1	0.2
March	0.1	0.1	0.2
April	0.3	0.4	0.7
May	0.2	0.4	0.6
June	0.4	0.7	1.2
July	0.9	1.4	2.4
August	0.9	1.4	2.3
September	1.0	1.6	2.6
October	1.5	3.2	4.6
November	1.4	3.0	4.4
December	1.4	3.2	4.7
Total	8.2	15.6	23.8

Figure 8[xvi]

Note: Tariff revenue (transfer from home country consumers to the government) is represented by area A of Figure 7.

Since the tariffs had a minimal effect on foreign prices, therefore, the tariff revenue in Figure 8 was a net transfer from domestic consumers to the government. Also, throughout 2018, the deadweight loss of the tariffs totaled $8.2 billion. This deadweight loss is the net loss to the US economy that resulted from the imposition of the tariffs (i.e., the total loss to consumers minus the gain to producers and the tax revenue yielded by the tariff.). It can also be seen as the sum of (i) the "consumption cost," which is the value of the import no longer bought by domestic consumers, and (ii) the "production cost," which is the additional cost to domestic producers of replacing units of the good that is no longer imported.[xvii]

Conclusion

In 2018, substantial tariffs levied by the Trump administration on imports from major trading partners were passed on to US firms and consumers completely, rejecting the conventional trade theory that tariffs levied by a large country should cause foreign firms to lower prices thus creating a gain to the home country via terms-of-trade effects. The conventional framework for estimating the price and welfare effects of a tariff, however, falls short of examining certain factors such as production relocation, firm-level decision, and full basket of prices available to consumers (both domestically produced and imported products)[xviii], requiring further studies.

---

[i] Fajgelbaum, Pablo, Pinelopi K. Goldberg, Patrick Kennedy and Amit Khandelwal (2018) "The Return to Protectionism: Causes and Consequences of the 2018 Trade War," Yale University, mimeograph.

[ii] Flaaen, Aaron, Ali Hortaçsu, and Felix Tintelnot. 2020. "The Production Relocation and Price Effects of U.S. Trade Policy: The Case of Washing Machines." *American Economic Review*, 110 (7): 2103-27.

[iii] Ibid.

[iv] Amiti, M., Redding, S., & Weinstein, D. (2019). The Impact of the 2018 Tariffs on Prices and Welfare. *The Journal of Economic Perspectives, 33*(4), 187-210. Retrieved

April 8, 2021, from https://www.jstor.org/stable/26796842.

[v] Ibid.

[vi] Ibid.

[vii] Ibid.,193.

[viii] Ibid.,194.

[ix] Ibid.

[x] Aaron et al.

[xi] Ibid.

[xii] Ibid.

[xiii] Ibid.

[xiv] Mary Amiti & Stephen J. Redding & David E. Weinstein, 2020. "Who's Paying for the U.S. Tariffs? A Longer-Term Perspective," *AEA Papers and Proceedings*, vol 110, pages 541-546.

[xv] Amiti et al (2019), 200.

[xvi] Amiti et al (2020), 550.

[xvii] Tuerck, D., & Burke, W. (2019, September). *An Analysis of Tariff Costs and Regulatory Savings Under Trump Administration Policies*. https://nfap.com/wp-content/uploads/2019/09/Tariffs-and-Regulations.NFAP-Policy Brief.September-2019.pdf.

[xviii] Amiti, Mary, Oleg Itskhoki and Jozef Konings (2019) "International Shocks, Variable Markups and Domestic Prices," *Review of Economic Studies, forthcoming*.