Public Affairs 856
Trade, Competition, and Governance in a Global Economy
Lecture 11-13
2/28-3/9/2022

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UW Madison
Spring 2022

version 25.3.2022

Import Tariffs and Quotas Under Perfect Competition

1. A Brief History of the World Trade Organization
2. The Gains from Trade
3. Import Tariffs for Small Country (Application: Steel)
4. Import Tariffs for a Large Country (Application: Trump Tariffs of 2017-19)
5. Import Quotas (Application: MFA)
6. (Moved to Lecture 16) Costs of Trade War of 2018-20

1) A Brief History of the World Trade Organization

- After World War II, the Allied countries met to discuss issues such as high trade barriers and unstable exchange rates.
- In 1947 the General Agreement on Tariffs and Trade (GATT) was established to reduce barriers to trade between nations.
- Some of the GATT's main provisions are as follows:
  1. A nation must extend the same tariffs to all trading partners that are GATT members.
  2. Tariffs may be imposed in response to unfair trade practices such as dumping.

     Recall that "dumping" is defined as the sale of export goods at a price less than that charged at home, or at a price less than costs of production and shipping.

1) A Brief History of the World Trade Organization

Some of the GATT's main provisions are as follows:

3. Countries should not limit the quantity of goods and services that they import.
4. Countries should declare export subsidies provided to particular firms, sectors, or industries. Article XVI deals with export subsidies and states that countries should notify each other of the extent of subsidies and discuss the possibility of eliminating them.
5. Countries can temporarily raise tariffs for certain products. Article XIX, called the safeguard provision or the escape clause, is our focus in this chapter.

1) A Brief History of the World Trade Organization

Some of the GATT's main provisions are as follows:

7. Regional trade agreements are permitted under Article XXIV of the GATT. The GATT recognizes the ability of blocs of countries to form two types of regional trade agreements:
   i. Free-trade areas, in which a group of countries voluntarily agree to remove trade barriers between themselves
   ii. Customs unions, which are free-trade areas in which the countries also adopt identical tariffs between themselves and the rest of the world

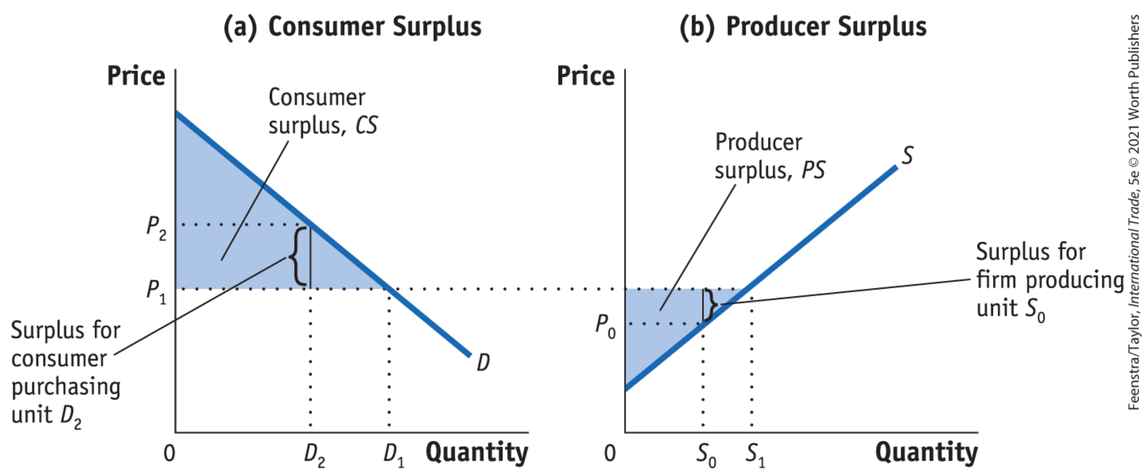
SIDE BAR: Key Provisions of the GATT

Article I	General Most-Favored-Nation Treatment
Article VI	Anti-Dumping and Countervailing Duties
Article XI	General Elimination of Quantitative Restrictions
Article XVI	Subsidies
Article XIX	Emergency Action on Imports of Particular Products
Article XXI	“Nothing in this agreement…” can prevent a party from protecting its security interests
Article XXIV	Territorial Application—Frontier Traffic—Customs Unions and Free-Trade Areas

2) The Gains from Trade

Consumer and Producer Surplus

FIGURE 8-1 (1 of 2) Consumer and Producer Surplus

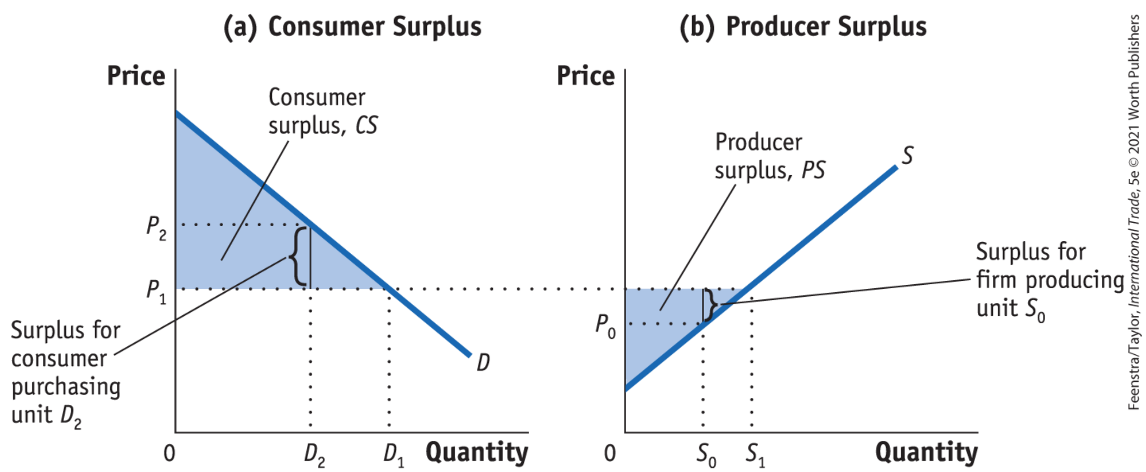


In panel (a), the consumer surplus from purchasing quantity D_1 at price P_1 is the area below the demand curve and above that price. The consumer who purchases D_2 is willing to pay price P_2 but has to pay only P_1. The difference is the consumer surplus and represents the satisfaction of consumers over and above the amount paid.

2) The Gains from Trade

Consumer and Producer Surplus

FIGURE 8-1 (2 of 2) Consumer and Producer Surplus



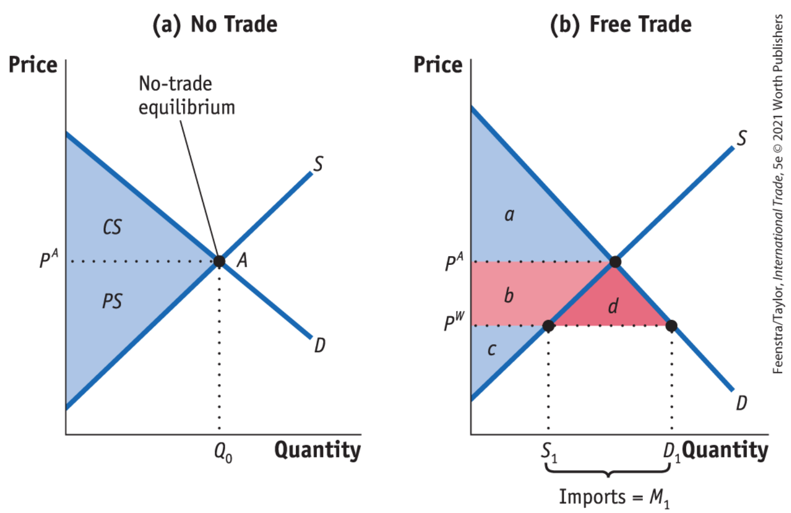
In panel (b), the producer surplus from supplying the quantity S_1 at the price P_1 is the area above the supply curve and below that price. The supplier who supplies unit S_0 has marginal costs of P_0 but sells it for P_1. The difference is the producer surplus and represents the return to fixed factors of production in the industry

2) The Gains from Trade

Home Welfare

No Trade, Free Trade for a Small Country, Gains from Trade

FIGURE 8-2



Rise in consumer surplus: +(b + d)

Fall in producer surplus: −b

Net effect on Home welfare: +d

The Gains from Free Trade in Home
With Home demand of D and supply of S, the no-trade equilibrium is at point A, at the price P^A producing Q_0.

With trade, the world price is P^W, so quantity demanded increases to D_1 and quantity supplied falls to S_1. Since quantity demanded exceeds quantity supplied, Home imports $D_1 - S_1$.

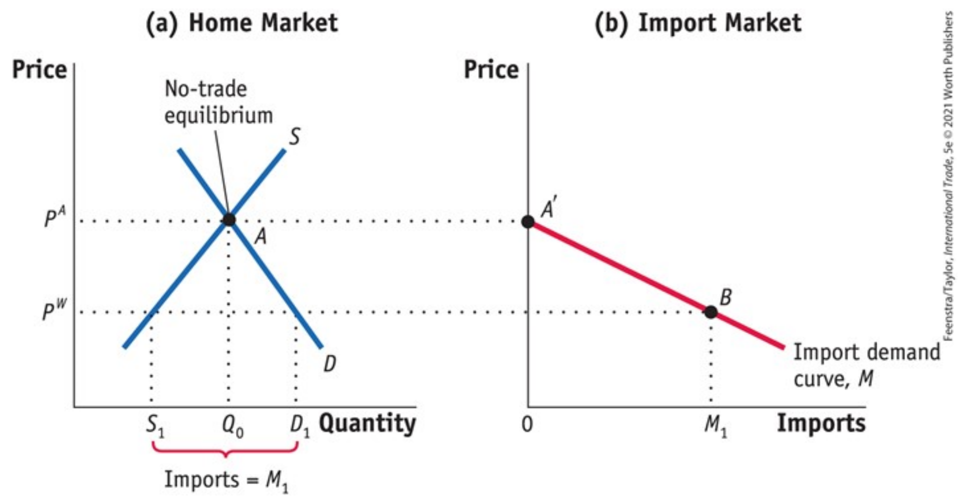
Consumer surplus increases by the area (b + d), and producer surplus falls by area b.

The gains from trade are measured by area d.

2) The Gains from Trade

Home Import Demand Curve

FIGURE 8-3



The import demand curve shows the relationship between the world price of a good and the quantity of imports demanded by Home consumers.

Home Import Demand With Home demand of D and supply of S, the no-trade equilibrium is at point A, with the price P^A and import quantity Q_0.

Import demand at this price is zero, as shown by the point A' in panel (b).

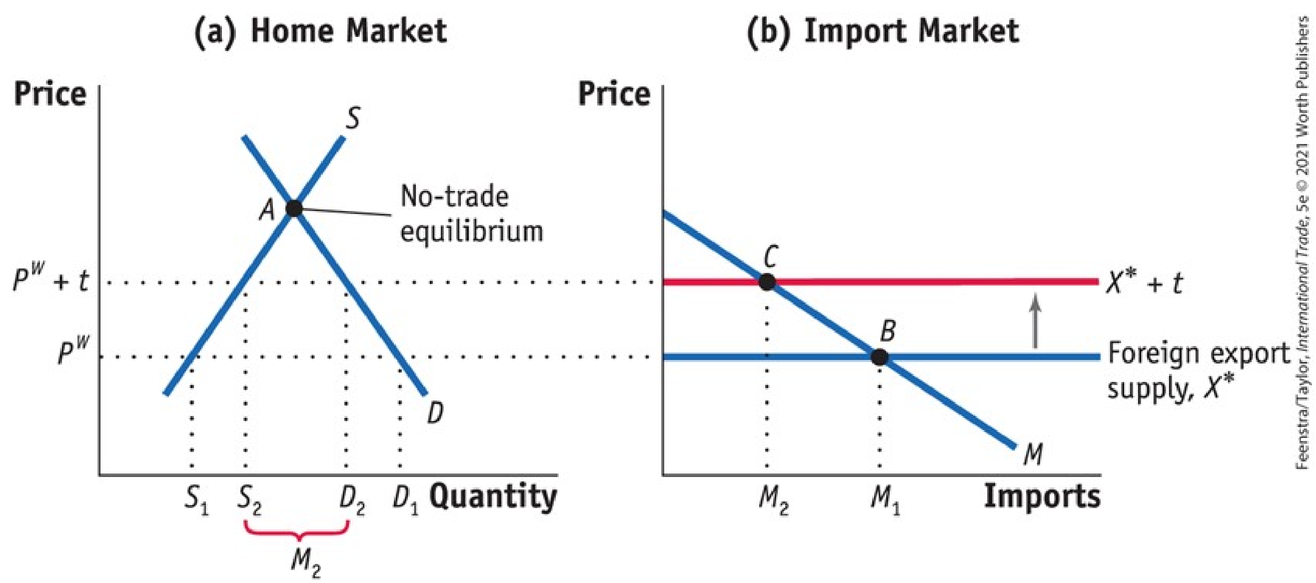
At a lower world price of P^W, import demand is $M_1 = D_1 – S_1$, as shown by point B.

Joining up all points between A' and B, we obtain the import demand curve, M.

3) Import Tariffs for a Small Country

Free Trade for a Small Country

FIGURE 8-4 (1 of 2) Tariff for a Small Country

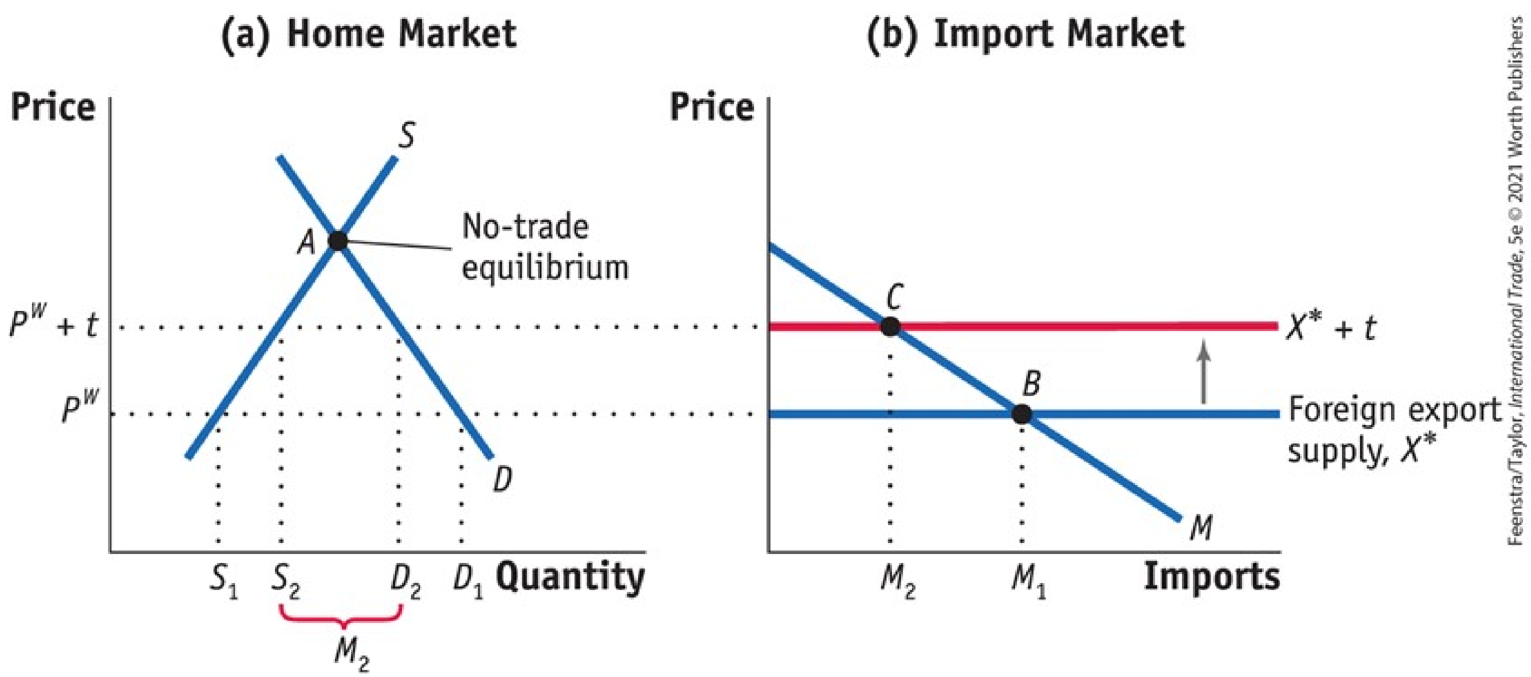


Applying a tariff of t dollars will increase the import price from P^W to $P^W + t$. The domestic price of that good also rises to $P^W + t$. This price rise leads to an increase in Home supply from S_1 to S_2, and a decrease in Home demand from D_1 to D_2, in panel (a).

3) Import Tariffs for a Small Country

Free Trade for a Small Country

FIGURE 8-4 (2 of 2) Tariff for a Small Country

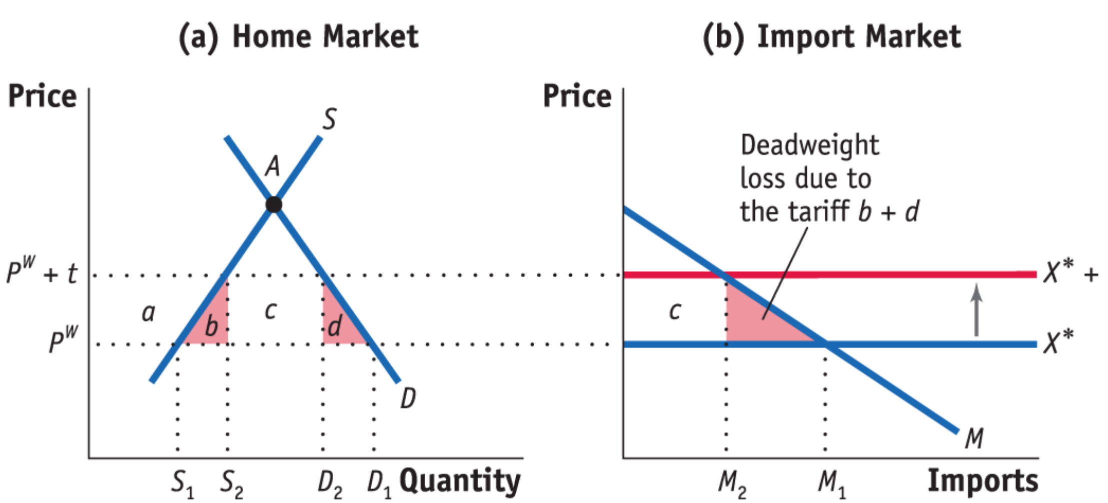


Imports fall due to the tariff, from M_1 to M_2 in panel (b). As a result, the equilibrium shifts from point B to C.

3) Import Tariffs for a Small Country

Effect of the Tariff on Consumer Surplus, Producer Surplus, Government Revenue; Overall Effect of the Tariff on Welfare; Production Loss; Consumption Loss

FIGURE 8-5 (1 of 2)

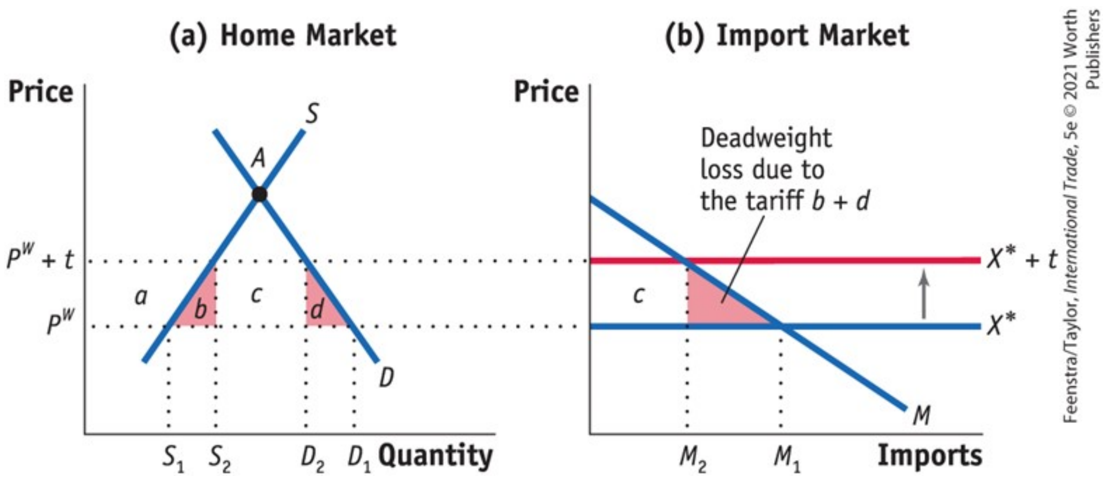


The tariff increases the price from P^W to $P^W + t$. As a result, consumer surplus falls by (a + b + c + d). Producer surplus rises by area a, and government revenue increases by the area c.

3) Import Tariffs for a Small Country

Effect of the Tariff on Consumer Surplus, Producer Surplus, Government Revenue; Overall Effect of the Tariff on Welfare; Production Loss; Consumption Loss

FIGURE 8-5 (2 of 2)



Fall in consumer surplus: −(a + b + c + d)

Rise in producer surplus: +a

Rise in government revenue: +c

Net effect on Home welfare: −(b + d)

Therefore, the net loss in welfare, the deadweight loss to Home, is (b + d), which is measured by the two triangles b and d in panel (a) or the single (combined) triangle b + d in panel (b).

The triangle (b + d) is a deadweight loss, or a loss that is not offset by a gain elsewhere in the economy.

APPLICATION: U.S. Tariffs on Steel, 2002-03

TABLE 8-1

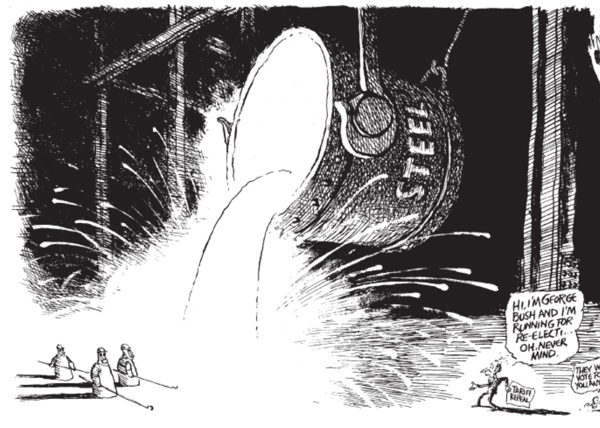
U.S. ITC Recommended and Actual Tariffs for Steel

Shown here are the tariffs recommended by the U.S. International Trade Commission for steel imports in 2002, and the actual tariffs that were applied in 2002.

Product Category	Tariff Recommended by the U.S. ITC (for 2002, %)	Actual U.S. Tariff (used in 2002, %)
Carbon and Alloy Flat Products		
Slab	20	30
Flat products	20	30
Tin mill products	U*	30
Carbon and Alloy Long Products		
Hot-rolled bar	20	30
Cold-finished bar	20	30
Rebar	10	15
Carbon and Alloy Tubular Products		
Tubular products	?**	15
Alloy fittings and flanges	13	13
Stainless and Tool Steel Products		
Stainless steel bar	15	15
Stainless steel rod	?**	15
Stainless steel wire	U*	8

APPLICATION: U.S. Tariffs on Steel, 2002-03

Deadweight Loss Due to the Steel Tariff



$$DWL = \frac{1}{2} \cdot \mathrm{t} \cdot \Delta M$$

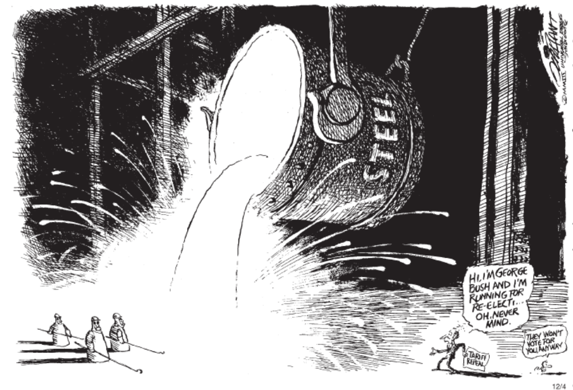
The deadweight loss relative to the value of imports equals:

$$\frac{DWL}{P^W \cdot M} = \frac{1}{2} \cdot \frac{t}{P^W \cdot M} = \frac{1}{2} \cdot \left(\frac{t}{P^W}\right) \cdot \%\Delta M$$

APPLICATION: U.S. Tariffs on Steel, 2002-03

Response of the European Countries

- The WTO has a dispute settlement procedure under which countries can bring their complaint and have it evaluated.



- The countries in the European Union (EU) took action by bringing the case to the WTO. The WTO ruling entitled the European Union and other countries to retaliate against the United States by imposing tariffs of their own against U.S. exports.
- The use of tariffs by an importer can easily lead to a response by exporters and a tariff war.

SIDE BAR: Provisions of U.S. Trade Law

- The Trade Expansion Act of 1962 and the Trade Act of 1974 describe conditions under which the United States can apply tariffs.
- **Section 201 (of the Trade Act of 1974): Safeguard Tariff** Allows temporary duties and other trade measures if the U.S. International Trade Commission determines that a surge in imports is *a substantial cause or threat of serious injury to a U.S. industry*.
- **Section 232 (of the Trade Expansion Act of 1962): National Security** Allows the adjustment of imports by using tariffs or quotas if the Department of Commerce finds that certain products are imported in such quantities or circumstances that *threaten to impair U.S. national security*.
- **Section 301 (of the Trade Act of 1974): Trade Agreements** Allows the suspension of trade agreement concessions or the imposition of import restrictions if a U.S. trading partner is *violating trade agreement commitments or engaging in discriminatory or unreasonable practices that burden or restrict U.S. commerce*.

APPLICATION: U.S. and Foreign Tariffs Under President Trump, 2018–19

TABLE 8-2

U.S. and Foreign Tariffs, 2018–19 Panel (a) of this table shows the tariffs applied on U.S. imports by the administration of President Trump during 2018–19. Panel (b) shows the tariffs applied on U.S. exports by foreign countries in retaliation for the U.S. import tariffs.

Product or Country	2017 Tariff (%)	First Date of Tariff*	2018 or 2019 Tariff** (%)	Trade Law
Washing machines	1.3	February 7, 2018	20–50	Section 201
Solar panels	0	February 7, 2018	30	Section 201
Steel	0	March–June, 2018	25	Section 232
Aluminum	2	March–June, 2018	12	Section 232
China (many products)	1.2–3.4	July 2018–October 2019	13.4–26.2	Section 301

Retaliating Country	2017 Tariff (%)	First Date of Tariff*	2018 or 2019** Tariff (%)	In Response to U.S. Tariffs on
China	7.8	April 2018–October 2019	22.7	Steel, aluminum, other products
Mexico	9.6	June 5, 2018	28	Steel, aluminum
Turkey	9.7	June 21, 2018	31.8	Steel, aluminum
European Union	3.9	June 22, 2018	29.2	Steel, aluminum
Canada	2.1	July 1, 2018	20.2	Steel, aluminum
Russia	5.2	August 6, 2018	36.8	Steel, aluminum
India	n.a.	June 15, 2019	10–70	Steel, aluminum

APPLICATION: U.S. and Foreign Tariffs Under President Trump, 2018–19

TABLE 8-3

Welfare Impact of 2018 and 2019 U.S. Tariffs Panel (a) shows the welfare impact of the 2018 U.S. tariffs, and the initial 10% tariffs applied to $200 billion of U.S. imports from China in September 2018. Panel (b) extends those results to include the increase in the U.S. tariffs on China during 2019.

	(1)	(2)	(3)
	Consumer Loss from Higher Import Prices	**Tariff Revenue**	**Deadweight Loss**
Annual cost ($ billions)	52.8	36.0	16.8
Annual cost per household ($)	414	282	132

	(1)	(2)	(3)
	Consumer Loss from Higher Import Prices	**Tariff Revenue**	**Deadweight Loss**
Annual cost ($ billions)	106	26.9	79.1
Annual cost per household ($)	831	211	620

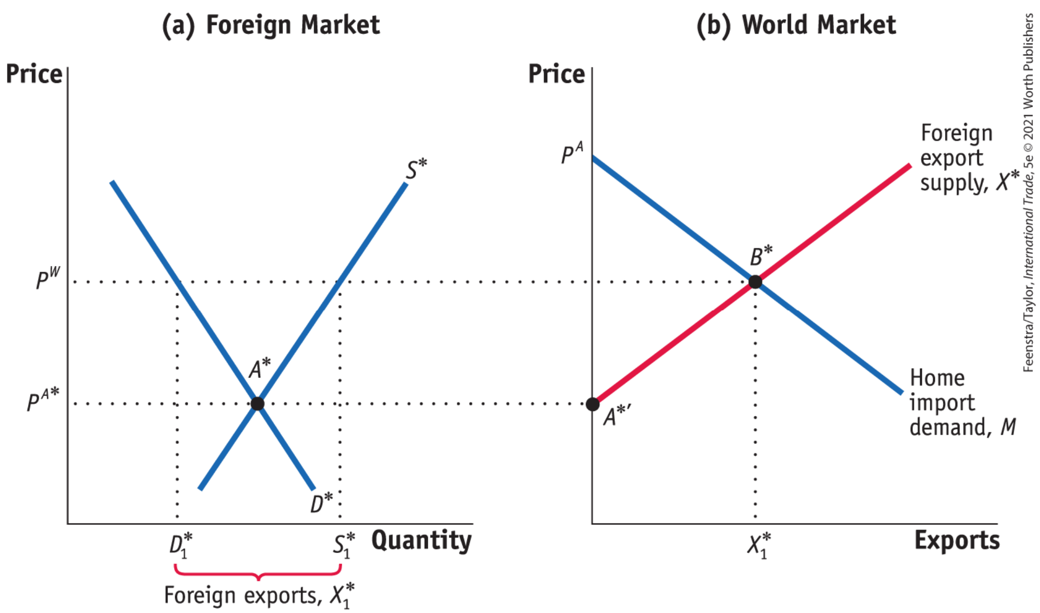
APPLICATION: The Political Economy of Tariffs

- If a tariff always leads to a deadweight loss of a small importing country, why then do the United States and many other countries use tariffs as part of their trade policies?
- Politics. The tariff benefits Home producers, so if the government cares more about the producer surplus than consumer surplus, it might decide to use the tariff despite the deadweight loss and consumer costs.
- Because benefits are concentrated and costs are spread more thinly and widely across the country, the industry has the greater political power to persuade the government to use the tariffs.

4) Import Tariffs for a Large Country

Foreign Export Supply

FIGURE 8-6 (1 of 3) Foreign Export Supply



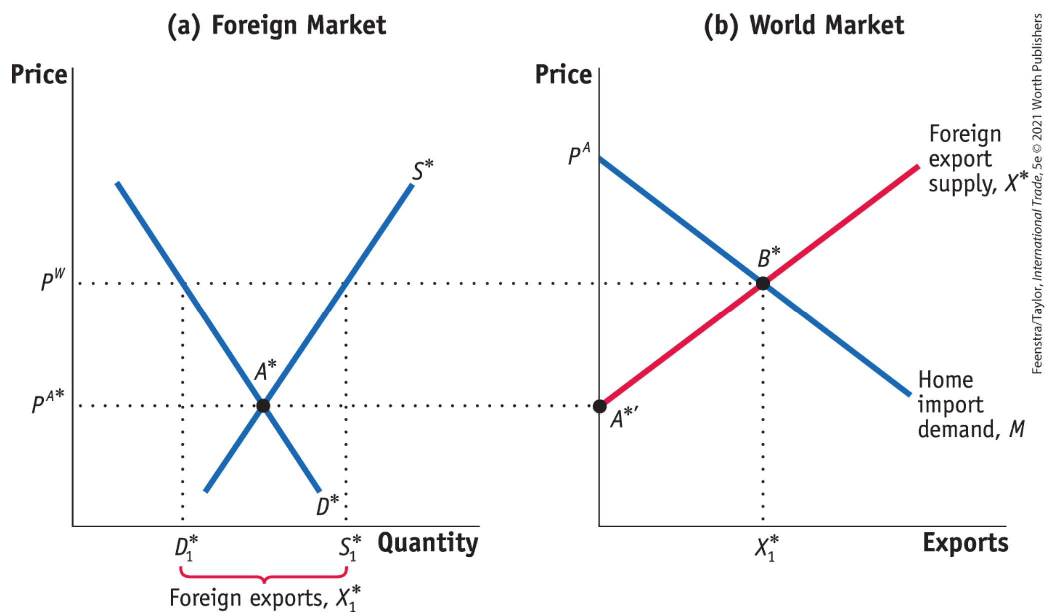
In panel (a), with Foreign demand of D^* and Foreign supply of S^*, the no-trade equilibrium in Foreign is at point A^*, with the price of P^{A*}.

At this price, the Foreign market is in equilibrium and Foreign exports are zero—point A^* in panel (a) and point $A^{*\prime}$ in panel (b), respectively.

4) Import Tariffs for a Large Country

Foreign Export Supply

FIGURE 8-6 (2 of 3) Foreign Export Supply



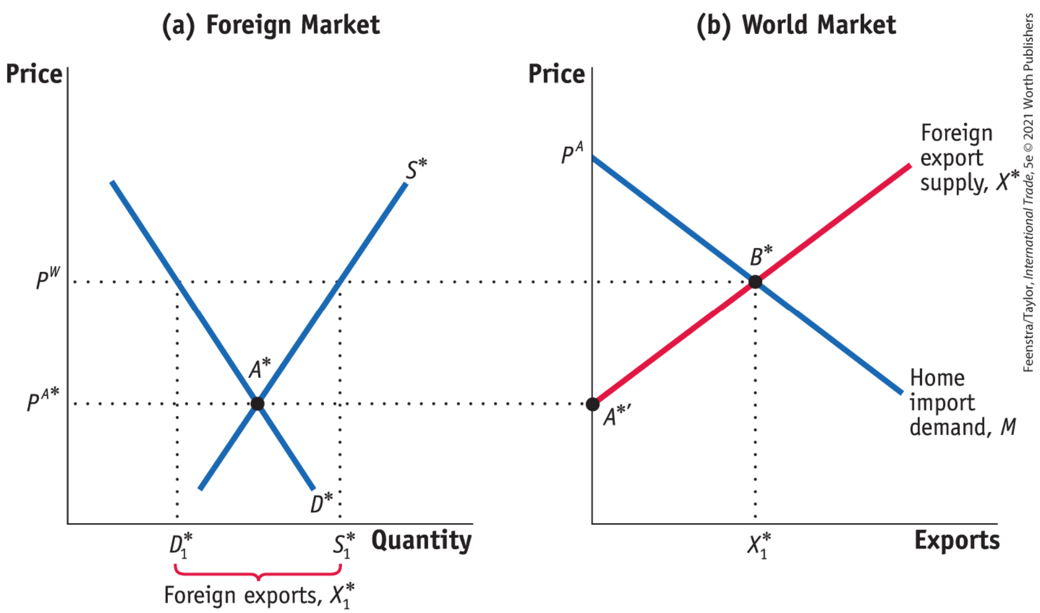
When the world price, P^W, is higher than Foreign's no-trade price, the quantity supplied by Foreign, S^*_1, exceeds the quantity demanded by Foreign, D^*_1, and Foreign exports $X^*_1 = S^*_1 - D^*_1$.

In panel (b), joining up points $A^{*\prime}$ and B^*, we obtain the upward-sloping export supply curve X^*.

4) Import Tariffs for a Large Country

Foreign Export Supply

FIGURE 8-6 (3 of 3) Foreign Export Supply



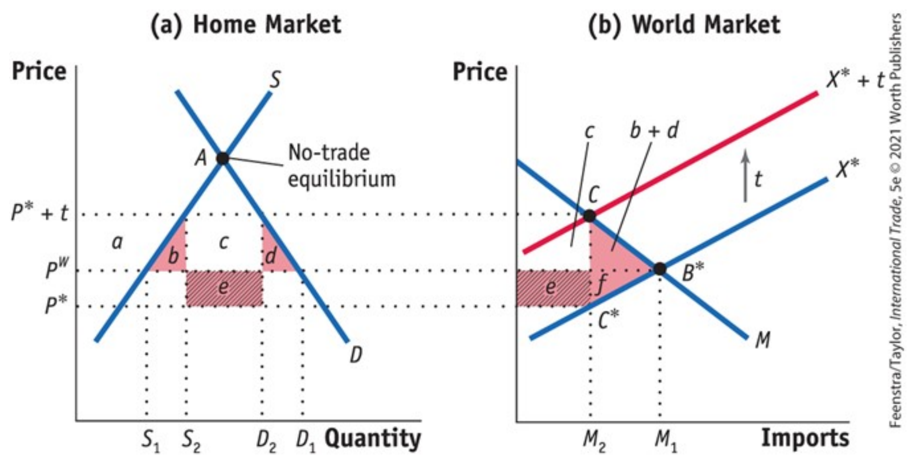
With the Home import demand of M, the world equilibrium is at point B^*, with the price P^W.

4) Import Tariffs for a Large Country

Effect of the Tariff

Terms of Trade, Home's Welfare, Foreign and World Welfare

FIGURE 8-7



Fall in consumer surplus: −(a + b + c + d)

Rise in producer surplus: +a

Rise in government revenue: +(c + e)

Net effect on Home welfare: e − (b + d)

Tariff for a Large Country

The tariff shifts up the export supply curve from X^* to X^*+ t.

As a result, the Home price increases from P^W to P^* + t, and the Foreign price falls from P^W to P^*.

The deadweight loss at Home is the area of the triangle (b + d), and Home also has a terms-of-trade gain of area e.

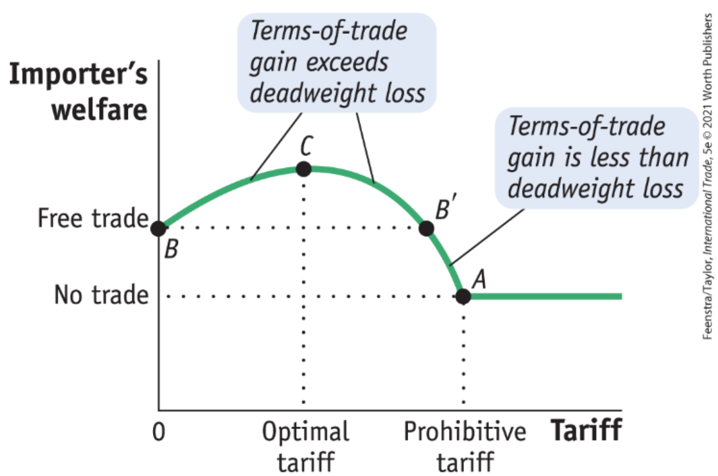
Foreign loses the area (e + f), so the net loss in world welfare is the triangle (b + d + f). Area e is a measure of the terms-of-trade gain for the importer.

4) Import Tariffs for a Large Country

Foreign Export Supply

Optimal Tariff for a Large Importing Country

FIGURE 8-8



Tariffs and Welfare for a Large Country For a large importing country, a tariff initially increases the importer's welfare because the terms-of-trade gain exceeds the deadweight loss. So the importer's welfare rises from point B. Welfare continues to rise until the tariff is at its optimal level (point C). After that, welfare falls. If the tariff is too large (greater than at B′), then welfare will fall below the free-trade level. For a prohibitive tariff, with no imports at all, the importer's welfare will be at the no-trade level, at point A.

Optimal Tariff Formula The formula depends on the elasticity of Foreign export supply, which we call E^*_X:

$$\text{Optimal tariff} = \frac{1}{E^*_X}$$

APPLICATION: U.S. Tariffs on Steel Once Again

Optimal Tariffs for Steel

TABLE 8-4

Optimal Tariffs for Steel Products This table shows optimal tariffs for steel products, calculated with the elasticity formula, as compared to actual tariffs used on U.S. steel imports in 2002–03 and 2018–19.

(1)	(2)	(3)	(4)	(5)
Product Category	**Elasticity of Export Supply**	**Optimal Tariff (%)**	**Actual Tariff (%) 2002–03**	**Actual Product Tariff (%) 2018–19**
Alloy steel flat-rolled products	0.27	370	30	25
Iron and steel rails and railway track	0.80	125	0	25
Iron and steel bars, rods, angles, shapes	0.80	125	15–30	25
Ferrous waste and scrap	17	6	0	25
Iron and steel tubes, pipes, and fittings	90	1	13–15	25
Iron and nonalloy steel flat-rolled products	750	0	0	25

APPLICATION: U.S. and Foreign Tariffs Under President Trump Once Again

TABLE 8-5

Welfare Impact of 2018 U.S. and Foreign Tariffs, with Terms-of-Trade Effects
This table shows the welfare impact of the 2018 tariffs on U.S. imports and of the foreign retaliatory tariffs on U.S. exports. These estimates treat the United States as a large country because it can influence export prices.

	(1)	(2)	(3)	(4)
	Consumer Loss from Higher Import Prices	**Tariff Revenue**	**Terms-of-Trade Gain**	**Net Loss**
Annual cost ($ billions)	68.8	39.4	21.6	7.8
Annual cost per household ($ billions)	539	309	169	61

5) Import Quotas

- On January 1, 2005, China was poised to become the world’s largest exporter of textiles and apparel. On that date, a system of worldwide import quotas known as the Multifibre Arrangement (MFA) was abolished.
- Besides the MFA, there are other examples of import quotas.
- For example, since 1993 Europe had a quota on the imports of bananas that allowed for a greater number of bananas to enter from its former colonies in Africa than from Latin America. This was converted to a tariff in 2005, which was reduced in 2009, ending this “banana war.”
- Another example is the quota on U.S. imports of cars from Japan, which began in 1981 and lasted through much of the 1980’s.

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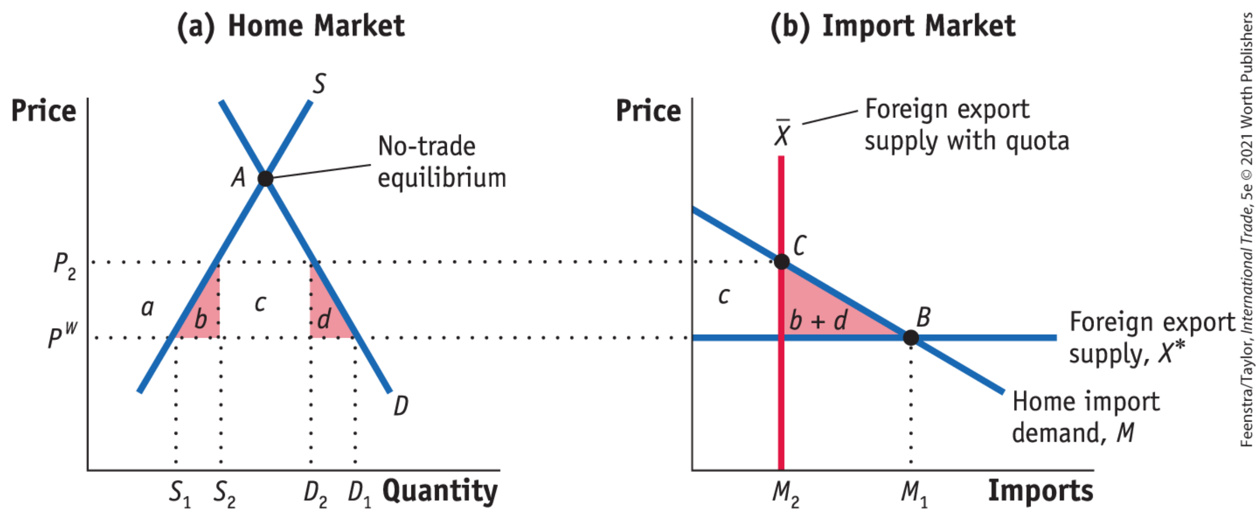
5) Import Quotas

Import Quota in a Small Country

Free-Trade Equilibrium, Effect of the Quota, Effect on Welfare

FIGURE 8-9

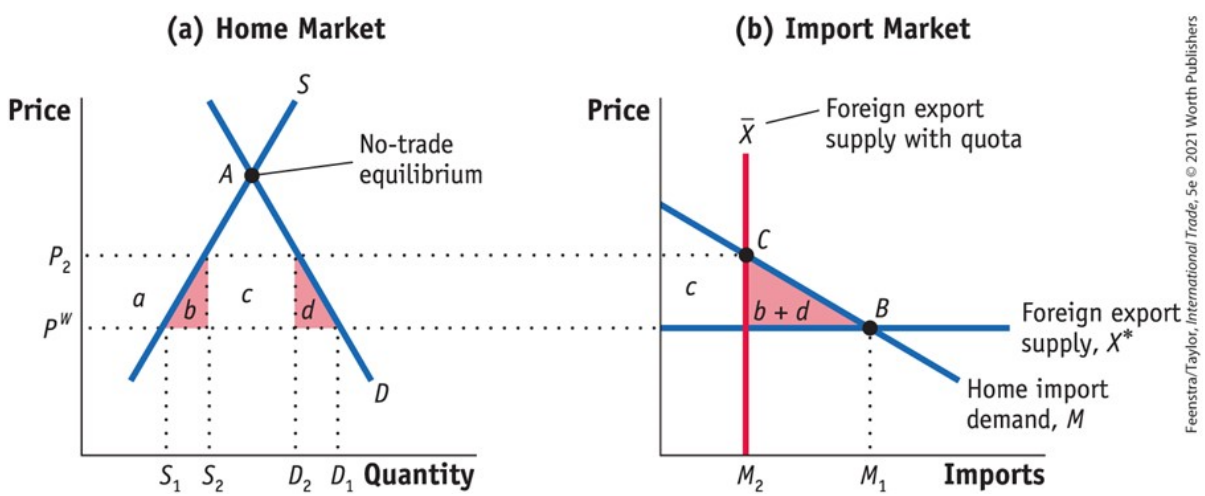


Quota for a Small Country Under free trade, the Foreign export supply curve is horizontal at the world price P^W, and the free-trade equilibrium is at point B with imports of M_1. Applying an import quota of $M_2 < M_1$ leads to the vertical export supply curve $\bar{X}$—with the equilibrium at point C. The quota increases the import price from P^W to P_2. There would be the same impact on price and quantities if instead of the quota, a tariff of $t = P_2 - P^W$ had been used.

5) Import Quotas

Import Quota in a Small Country

FIGURE 8-9



- The quota and tariff differ in terms of area c in Figure 8-9, which would be collected as government revenue under a tariff.
- Under the quota, this area equals the difference between the domestic price P_2 and the world price P^W, times the quantity of imports M_2.

5) Import Quotas

Import Quota in a Small Country

- Whoever is actually importing the good will be able to earn the difference between the world price P^W and the higher Home price P_2 by selling the imports in the Home market.

- We call the difference between these two prices the rent associated with the quota, and hence the area c represents the total quota rents.

- Next we examine the four possible ways that these quota rents can be allocated.

5) Import Quotas

Import Quota in a Small Country

1. Giving the Quota to Home Firms

Quota licenses (i.e., permits to import the quantity allowed under the quota system) can be given to Home firms: With home firms earning the rents c, the net effect of the quota on Home welfare is

Fall in consumer surplus:	−(a + b + c + d)
Rise in producer surplus:	+a
Quota rents earned at Home	+c
Net effect on Home welfare:	−(b + d)

5) Import Quotas

Import Quota in a Small Country

2. Rent Seeking

If licenses for the imported chemicals are allocated in proportion to each firm's production of batteries in the previous years, then the Home firms will likely produce more batteries than they can sell (and at lower quality) just to obtain the import licenses for the following year.

Alternatively, firms might engage in bribery or other lobbying activities to obtain the licenses.

These kinds of inefficient activities done to obtain quota licenses are called rent seeking. If rent seeking occurs, the welfare loss due to the quota will be

Fall in consumer surplus: −(a + b + c + d)

Rise in producer surplus: +a

Net effect on Home welfare: −(b + c + d)

5) Import Quotas

Import Quota in a Small Country

3. Auctioning the Quota

A third possibility for allocating the rents that come from the quota is for the government of the importing country to auction off the quota licenses.

In a well-organized, competitive auction, the revenue collected should exactly equal the value of the rents, so that area c would be earned by the Home government.

Using the auction method to allocate quota rents, the net loss in domestic welfare due to the quota becomes

Fall in consumer surplus: −(a + b + c + d)
Rise in producer surplus: +a
Auction revenue earned in Home: + c

Net effect on Home welfare: −(b + d)

5) Import Quotas

Import Quota in a Small Country

4. “Voluntary” Export Restraint

The final possibility for allocating quota rents is for the government of the importing country to give authority for implementing the quota to the government of the exporting country.

Because the exporting country allocates the quota among its own producers, this is sometimes called a “voluntary” export restraint (VER), or a “voluntary” restraint agreement (VRA).

In the 1980s the United States used this type of arrangement to restrict Japanese automobile imports.

In this case, the quota rents are earned by foreign producers, so the loss in Home welfare equals

Fall in consumer surplus: −(a + b + c + d)

Rise in producer surplus: +a

Net effect on Home welfare: −(b + c + d)

5) Import Quotas

Import Quota in a Small Country

Costs of Import Quotas in the United States

TABLE 8-6

Annual Cost of U.S. Import Protection ($ billions) Shown here are estimates of the deadweight losses and quota rents due to U.S. import quotas in the 1980s, for the years around 1985. Many of these quotas are no longer in place today.

	U.S. Deadweight Loss (area *b* + *d*)	Quota Rents (area *c*)
Automobiles	0.2–1.2	2.2–7.9
Dairy	1.4	0.25*
Steel	0.1–0.3	0.7–2.0
Sugar	0.1	0.4–1.3
Textiles and apparel	4.9–5.9	4.0–6.1
Import tariffs	1.2–3.4	0
Total	7.9–12.3	7.3–17.3

APPLICATION: China and the Multifibre Arrangement

- One of the founding principles of GATT was that countries should not use quotas to restrict imports.
- The Multifibre Arrangement (MFA), organized under the auspices of the GATT in 1974, was a major exception to that principle and allowed the industrial countries to restrict imports of textile and apparel products from the developing countries.
- Importing countries could join the MFA and arrange quotas bilaterally (i.e., after negotiating with exporters) or unilaterally (on their own).

APPLICATION: China and the Multifibre Arrangement

Growth in Exports from China

- The MFA expired on January 1, 2005. The biggest potential supplier of textile and apparel products was China. Immediately, exports of textiles and apparel from China grew rapidly.

Welfare Cost of MFA

- Given the drop in prices in 2005 from countries selling to the United States, it is possible to estimate the welfare loss due to the MFA.
- The United States did not auction the quota licenses for textiles and apparel, so the quota rents were earned by foreign exporting firms.
- That means the welfare loss for the United States due to the MFA is the area (b + c + d) in Figure 8-9.

APPLICATION: China and the Multifibre Arrangement

Import Quality

- The prices of textile and apparel products dropped the most (in percentage terms) for the lower-priced items.
- So an inexpensive T-shirt coming from China and priced at $1 had a price drop of more than 38% (more than 38¢), whereas a more expensive item priced at $10 experienced a price drop of less than 38% (less than $3.80).
- As a result, U.S. demand shifted toward the lower-priced items imported from China: There was “quality downgrading” in the exports from China.

APPLICATION: China and the Multifibre Arrangement

Reaction of the United States and Europe

- The European Union threatened to impose new quotas on Chinese exports, and in response, China agreed on June 11, 2005, to "voluntary" export restraints.
- Due to the worldwide recession, Chinese exports in this industry were much lower in 2009 than they had been in earlier years.
- China indicated that it would not accept any further limitation on its ability to export textile and apparel products to the United States and Europe, and both these quotas expired.

APPLICATION: China and the Multifibre Arrangement

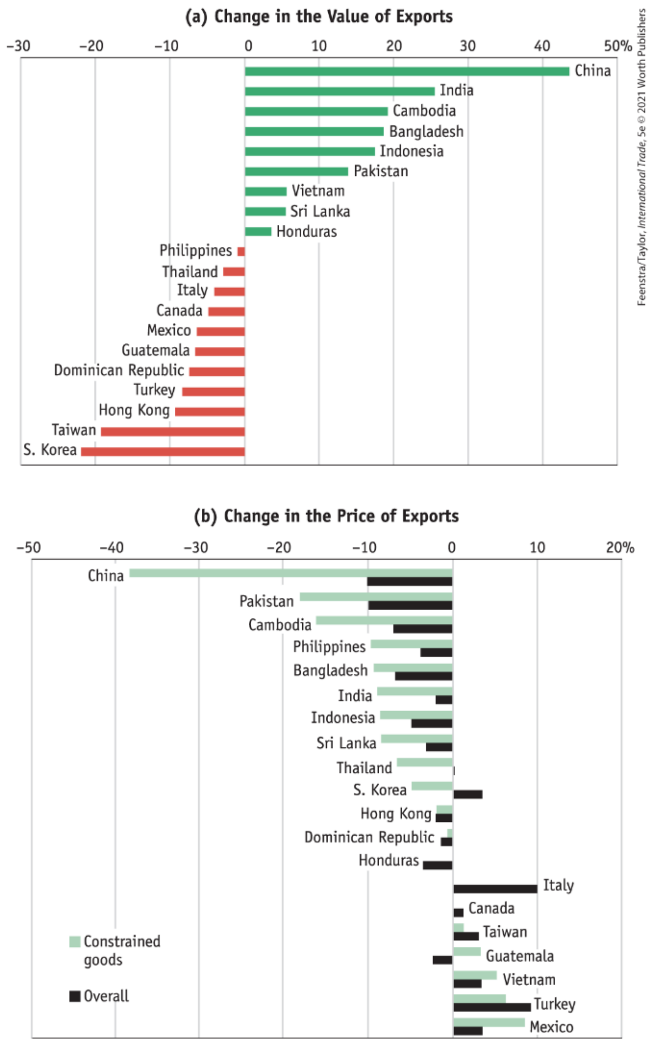


FIGURE 8-10 (1 of 2)

Changes in Clothing and Textile Exports to the United States After the MFA, 2004–05

After the expiration of the Multifibre Arrangement (MFA), the value of clothing and textile exports from China rose dramatically, as shown in panel (a). This reflects the surge in the quantity of exports that were formerly constrained under the MFA as well as a shift to Chinese exports from other, higher-cost producers such as Hong Kong, Taiwan, and South Korea.

APPLICATION: China and the Multifibre Arrangement

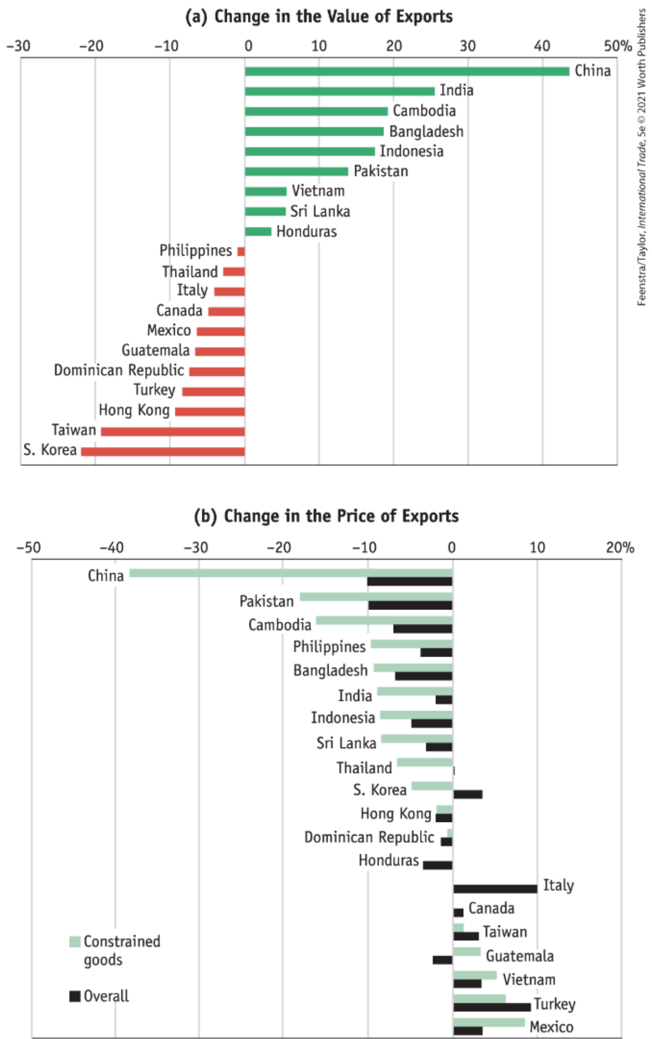


FIGURE 8-10 (2 of 2)

Changes in Clothing and Textile Exports to the United States After the MFA, 2004–05

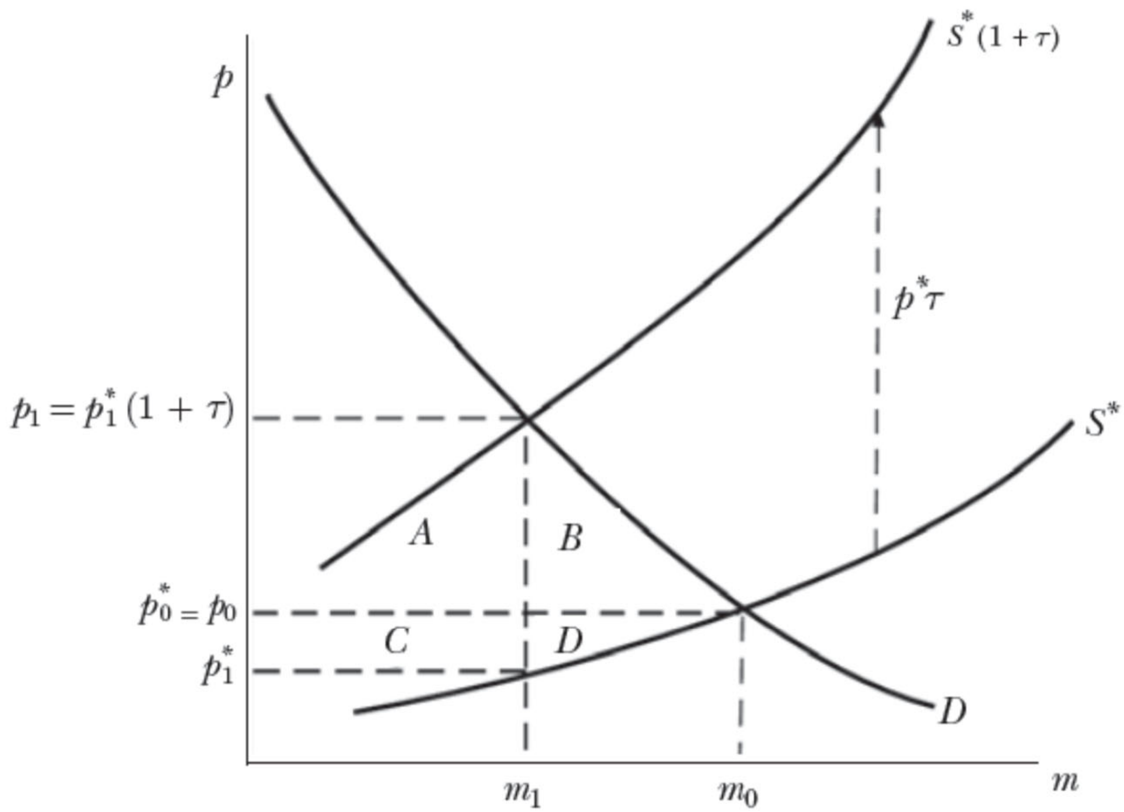
In panel (b), we see that the prices of goods constrained by the MFA typically fell by more than the average change in export prices after the MFA's expiry. This is exactly what our theory of quotas predicts: the removal of quotas lowers import prices for consumers.

Conclusions (part 1)

- A tariff on imports is the most commonly used trade policy tool.
- Assuming a small country, when we add together all the effects of a tariff—the drop in consumer surplus, the gain in producer surplus, and the government revenue collected—we still get a net loss for the importing country, which is a deadweight loss resulting from the tariff.
- Why are tariffs used then?
  - They are an easy way for governments to raise revenue.
  - Politics. The government might care more about protecting firms than avoiding losses for consumers.
  - The small-country assumption may not hold in practice.

Empirical Estimates of Trump Tariffs, 2018-2020
(Moved to end of Lecture 16)

Figure 1
Impact of a Tariff on Prices

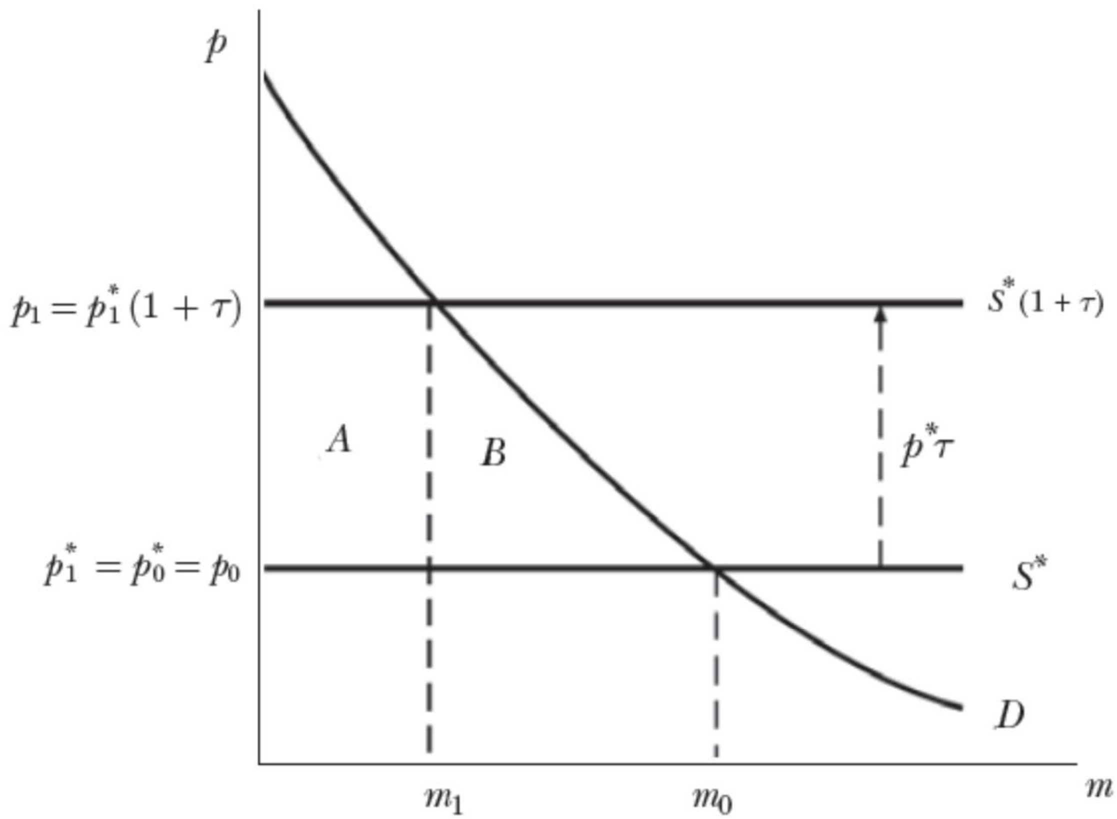


Source: Authors.
Note: Horizontal axis shows the quantity of imports; vertical axis displays the price of the good; D corresponds to the import demand curve; S^* represents the export supply curve.

Amiti, et al., Journal of Economic Perspectives, (2018)

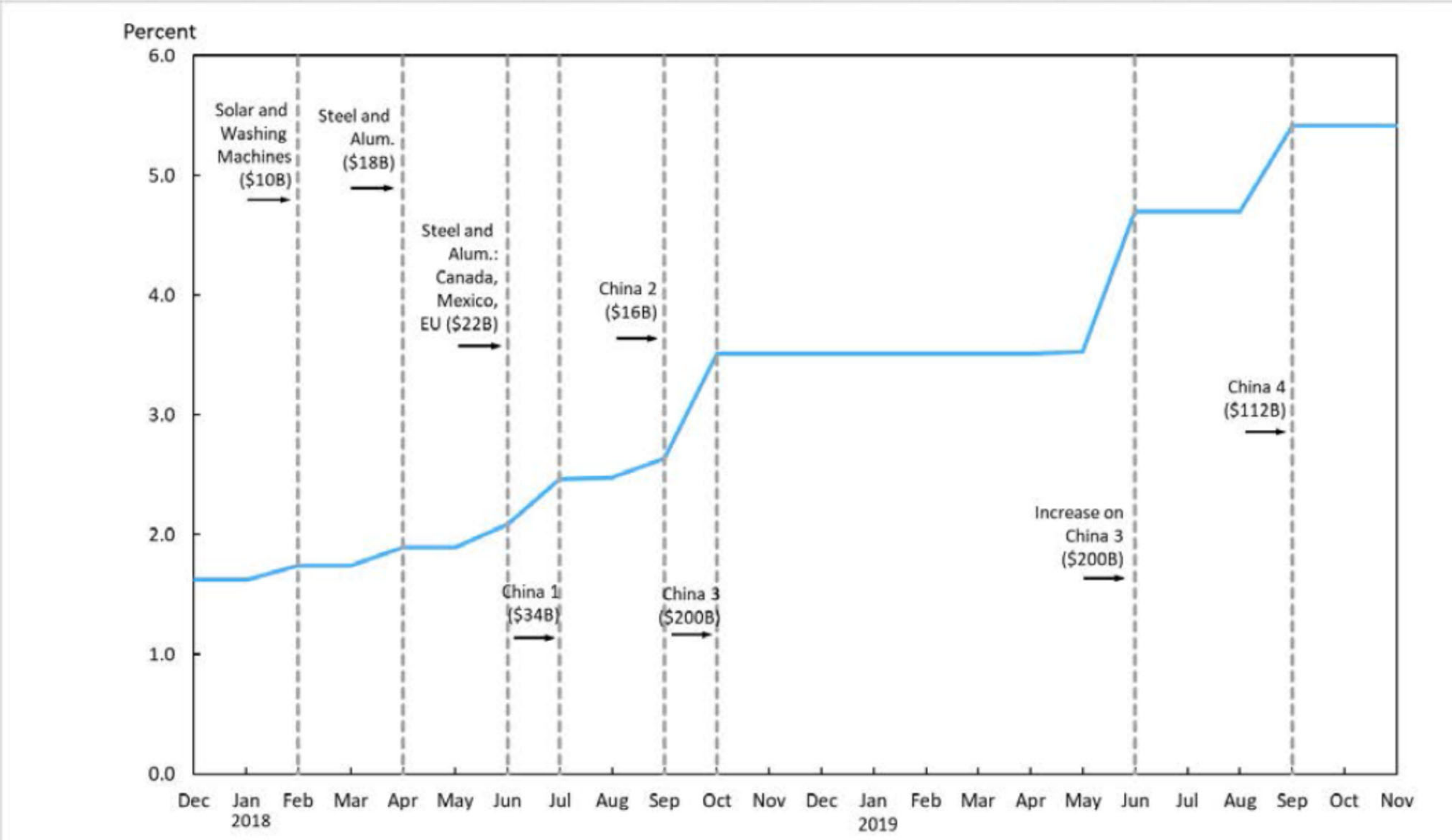
Empirical Estimates of Trump Tariffs, 2017-2019

Figure 2
Impact of a Tariff on Prices with Perfectly Elastic Export Supply



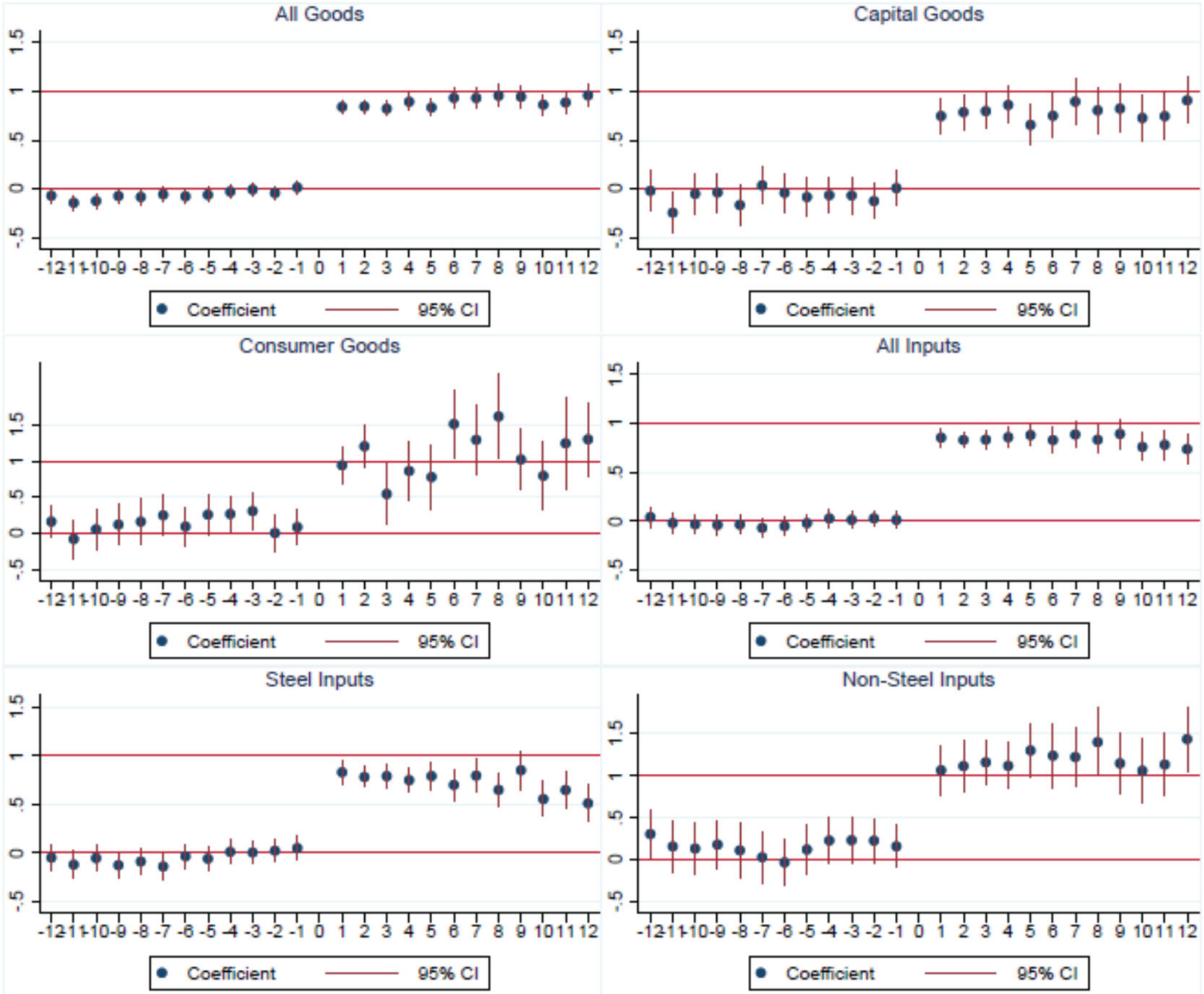
Source: Authors.
Note: Horizontal axis shows the quantity of imports; vertical axis displays the price of the good; D corresponds to the import demand curve; S^* represents the export supply curve.

Figure 1: Average U.S. Tariffs by Wave of the 2018-2019 Trade War



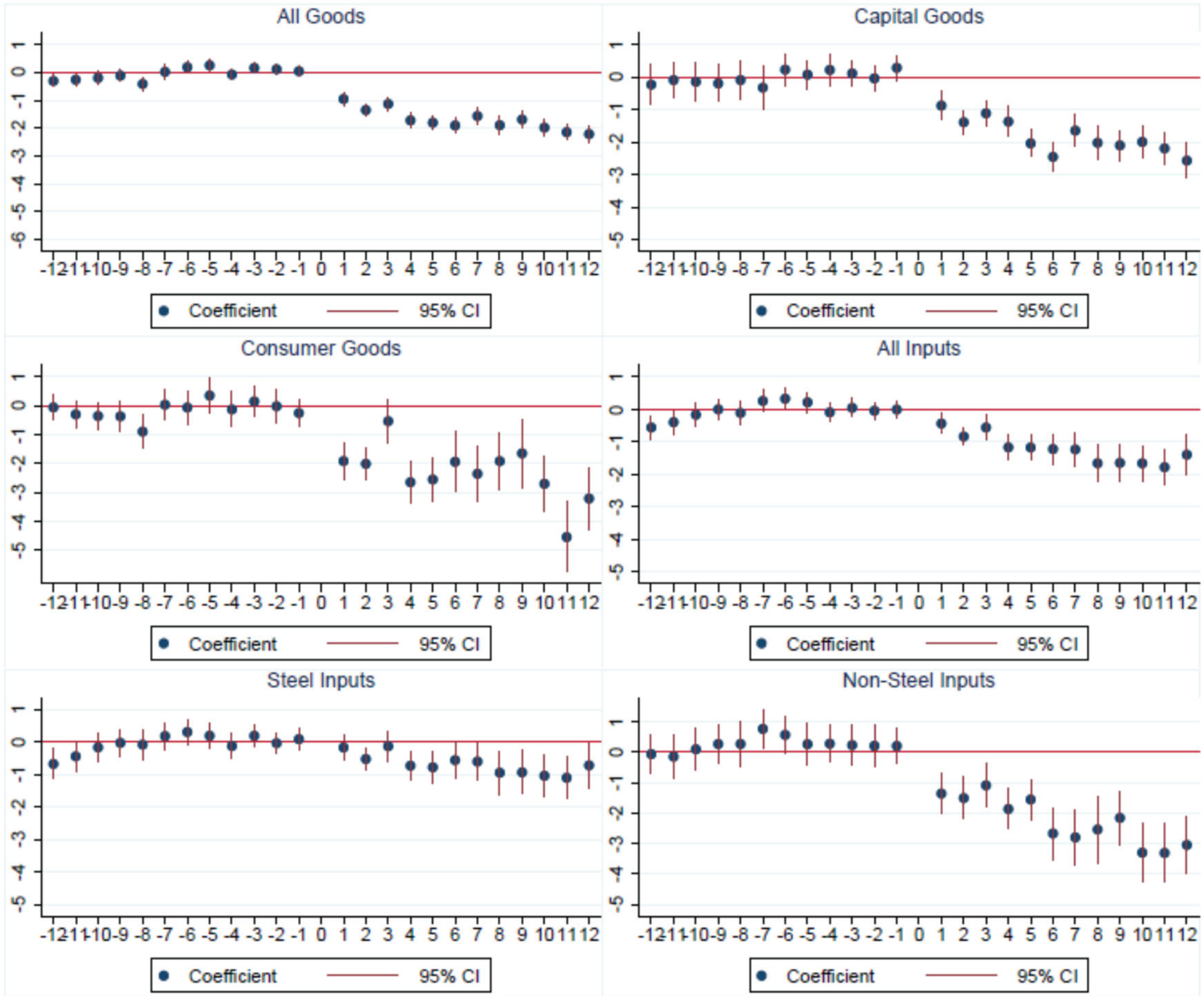
Notes: Authors calculations based on data from the US Census Bureau; US Trade Representative (USTR); US International Trade Commission. Tariffs on the 10-digit Harmonized Tariff Schedule (HTS) product code by country, weighted by 2017 annual import value. Dashed vertical lines indicate the implementation of each of the eight major waves of new tariffs during 2018-2019; tariffs implemented after the 15th of the month counted for the subsequent month. Four tranches of tariffs were imposed on China, designated by 1, 2, 3, and 4. Import values associated with each line correspond to headline numbers, not 2017 values, which are a little lower.

Figure 2: Log Import Prices (Inclusive of Tariffs)



Notes: Authors calculations based on data from the US Census Bureau; US Trade Representative (USTR); US International Trade Commission. Points correspond to the elasticities of the tariff-inclusive import price with respect to tariffs (β_s) obtained from estimating equation (1).

Figure 3: Log Import Values



Notes: Authors calculations based on data from the US Census Bureau; US Trade Representative (USTR); US International Trade Commission. Points correspond to the elasticities of import value with respect to tariffs (β_s) obtained from estimating equation (1).

Empirical Estimates (through 2018)

Table 3

Impact of Foreign Tariffs on US Exporting

	log change US export prices (1)	*log change foreign import quantities* (2)	*log change foreign import quantities* (3)	*log change foreign import values* (4)	*log change foreign import values* (5)
	$\Delta\ln(p_{ijt}^{US})$	$\Delta\ln(x_{ijt}^{US})$	$\Delta\ln(x_{ijt}^{US})$	$\Delta\ln(p_{ijt}^{US} \times x_{ijt}^{US})$	$\Delta\ln(p_{ijt}^{US} \times x_{ijt}^{US})$
log change tariff	0.077**	−1.233***	−3.498***	−1.134***	−3.942***
$\Delta\ln(1 + Tariff_{ijt})$	(0.034)	(0.146)	(0.710)	(0.130)	(0.827)
N	1,320,495	1,320,495	2,784,226	2,191,243	3,930,620
R^2	0.014	0.011	0.076	0.013	0.072

Note: Observations are at the HTS10-country-month level for the period January 2017 to December 2018. Variables are in twelve-month log change. All columns include HTS10 product fixed effects and country-year fixed effects. Columns 1–3 drop any observations with a ratio of unit values in t relative to $t-12$ greater than 3 or less than 1/3. The dependent variable in column 1 is the log change of prices (excluding the tariff) charged by US exporters. The dependent variables in columns 2 and 3 are the log change and the change in the inverse hyperbolic sine of foreign import quantities (US export quantities). The dependent variables in column 4 and 5 are the log change and the change in the inverse hyperbolic sine of foreign import values (US export values). We use the inverse of the hyperbolic sine transformation $\log[x + (x^2 + 1)^{0.5}]$ to be able to estimate changes when import quantities or values are zero in t or $t-12$. Standard errors reported in parentheses are clustered at the Harmonized System six-digit (HS6) level, because foreign export tariffs vary at the HS6 level. For additional details of the regression and full results, see the online Appendix available with this article at the *Journal of Economic Perspectives* website.

*, **, and *** indicate significance levels of $p < 0.10$, $p < 0.05$, and $p < 0.01$, respectively.

Amiti, et al., JEP (2018)