Who is Paying for the Trade War with China?

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On September 24th 2018, the United States introduced import tariffs on a wide range of Chinese products. The tariffs will affect US imports from China with a value that exceeds USD 250 billion -around 50% of all imports. In this analysis we show that, contrary to public opinion, the greatest share of the tariff burden falls not on American consumers or firms, but on Chinese exporters. We calibrate a simple economic model and find that a 25 percentage point increase in tariffs raises US consumer prices on all affected Chinese products by only 4.5% on average, while the producer price of Chinese firms declines by 20.5%. The US government has strategically levied import duties on goods with high import elasticities, which transfers a great share of the tariff burden on to Chinese exporters. Chinese firms pay approximately 75% of the tariff burden and the tariffs decrease Chinese exports of affected goods to the United States by around 37%. This implies that the bilateral trade deficit between the US and China drops by 17%. The additional tariffs generate revenues of around USD 22.5 billion, which could subsequently be redistributed in the US. Although the tariffs introduce a distortion to US consumption decisions, the economic costs are shifted to Chinese exporting firms and the US government is able to extract a net welfare gain of USD 18.4 billion. Autor, Dorn and Hanson (2013, 2016) show that Chinese import competition can have dramatic negative effects on the US labour market. On the other hand, most economists agree that international trade has positive effects for the economy as a whole. The overall gains from trade are high enough to compensate those groups that lose out. These opposing views also characterise general public opinion in the US. Stokes (2018) shows that most Americans believe that international trade is good for the economy, but that they personally do not gain from it, particularly in the labour market. Trade in general, and the US trade deficit with China in particular, has a bad reputation.

Trade Tensions

Considering that President Trump has repeatedly ranted about the trade deficit with China on Twitter and elsewhere, it is not surprising that the trade tensions between the US and China have escalated dramatically in the past months. Late in 2017 the US trade commission found that imports of washing machines and solar panels from China were damaging the corresponding US industries. In January 2018, President Trump levied safeguard tariffs on both products. Three months later China introduced anti-dumping tariffs on US-grown sorghum. At the same time, the US administration published a tariff list of 1,333 Chinese products with an import value of USD 50 billion. Referring to Section 301 of the US Trade Act of 1974, the US government argued that Chinese laws and policies may be discriminatory and harmful to US intellectual property rights and technology development. In June 2018 the Chinese government reacted with its own tariff list for US products. Since August 23rd 2018, both countries have applied tariffs on all of the products on their respective lists. Instead of negotiating over the issues and finding solutions, both parties let the trade conflict escalate further. In September 2018 the US administration introduced a second tariff list featuring Chinese products with an import value of around USD 200 billion.

While initially additional tariffs of only 10 percentage points were planned, President Trump later extended these tariffs to 25 percentage points. On September 24th 2018 the US tariffs took effect, affecting around 50% of the US import volume from China, which corresponds to 12% of all US imports.
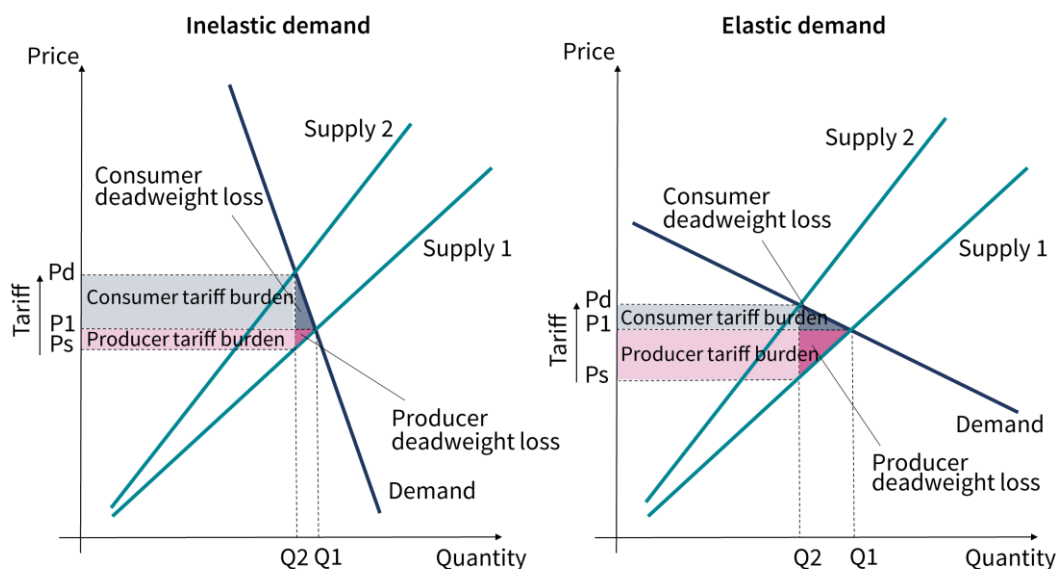
Bown and Kolb (2018) have written an extensive up-to-date guide on the US's trade conflicts.

Economic Costs

As the new tariffs affect a significant share of US imports, it is important to analyse their economic consequences and effects. Often only the sheer size of the affected import volume is discussed, while questions of the economic incidence of the tariffs, as well as their potential revenues, are neglected. Gloe Dizioli und van Roye in the ECB Bulletin (2018), for example, show that tariff revenues are not redistributed at all, and that any tariff policy is restrictive as a result.[1]

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[1] The adjustment process of relative prices in standard models of international trade seems to have no effect in their model. In their analysis, the US tariffs even increase the GDP of China. Thus, gains from non-trade for China are positive and improve the real exchange rate. This can be explained by an overcompensation in monetary policy due to the trade shock.

Figure 1:

Tariff incidence on a partial market without domestic supply

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The US import tariffs will increase the prices of the affected Chinese products in the United States and decrease the profit margin of Chinese exporters. This might force some Chinese firms to stop exporting to the US, or even force them completely out of the market. In turn, this could lead to shortages and serious problems for supply chains in the United States. To diminish this effect, the US administration planned to increase the tariff only gradually until the end of 2018. It is not clear if this timeframe will be sufficient for US firms, and especially US multinationals, to adjust their supply chains.

In addition to shortages, an increase in US consumer prices will be the most obvious effect. This will affect US customers and intermediate input sourcing firms. The price effect depends on the relative price elasticity. If the reaction of US consumers to a price increase is smaller than the reaction of Chinese producers, the tariff burden will mostly fall on US consumers. Should the reverse occur, producer prices will decline and exporting firms will forgo profits. The relative effect partly depends on the availability of substitute products. A tariff levied on salt will hit consumers harder, as they cannot easily substitute salt by using more pepper, for example. On the other hand, consumers could easily avoid a tariff on peanut butter by consuming more marmalade. In this second case, producers would bear most of the incidence of the tariff in order to remain competitive.

The split of the economic burden of a tariff is called tariff incidence. It is worth noting that the legal incidence is independent of the economic incidence. It does not matter if

the exporter or importer pays the tariff. The (economic) tariff incidence refers to the relative changes in consumer and producer prices.

Figure 1 depicts the tariff incidence for a partial market without direct domestic competition. If a tariff were (legally) levied on consumers, prices would increase. However, consumers have the possibility to avoid the tariff by consuming other goods, thereby passing some of the burden onto the producer. The slope of the demand curve indicates (among other things) how easily consumers can substitute goods. The steeper (more inelastic) the demand function, the harder it is for consumers to substitute for other goods; while the flatter (more elastic) it is, the easier. Without tariffs, the supply and demand equalise at price P_1 and quantity Q_1. The producer and consumer prices are identical. An import tax of 25% drives a wedge between the consumer price P_n and the producer price P_a. The Supply 2 function includes the tariff and turns away from the old Supply 1 function. With an inelastic demand function, the imported quantity will decrease only slightly, as consumers have fewer options for substitution. In this case, the producer price declines far less than the consumer price increases, with most of the economic burden levied on consumers. With an elastic demand function the effect is reversed. A price increase leads to a drastic reduction in the imported quantity, as consumers can easily substitute the more expensive goods. The producer price declines much more than the consumer price increases. Now most of the economic burden is levied on the producer.

In both cases, the tariff introduces a distortion of the consumption and production decisions of consumer and producers respectively. This implies a welfare loss for both groups. The welfare loss depends on the quantity reduction, on the change of the price due to the tariffs; and ultimately on the relative price elasticities of consumers and producers. A price increase for domestic consumers reduces their demand and consumption. Paying more for less is an obvious welfare loss for consumers, as shown by the green triangle in Figure 1. The welfare loss of the foreign supplier is given by the red triangle in Figure 1. But a tariff does not only generate consumer and producer welfare losses; there are also tariff revenues that must be taken into consideration. The US Treasury will collect total tariff revenues of $(P_n - P_a) Q_2$, but only $(P_n - P_1) Q_2$ will be paid by US consumers, while $(P_1 - P_a) Q_2$ are borne by Chinese exporters. This can be seen as a direct transfer by Chinese firms to the US government. The red rectangle in Figure 1 indicates these Chinese transfers. The tariff revenues can be distributed to US consumers and could increase US welfare.[1]

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[1] On Twitter President Trump repeatedly refers to the increased tax revenues due to the import tariffs. Indeed these revenues could be used to finance tax reforms. Thus, the redistribution argument might be valid.

A tariff could increase US welfare (defined as US consumer rent plus tariff revenues) if the transfer financed by (foreign) tariff revenues exceeds the welfare loss due to a reduction of US consumption. In Figure 1 the area of the red rectangle has to be greater than the green triangle, i.e. the tariffs paid by Chinese exporting firms have to be higher than the US consumer welfare loss.
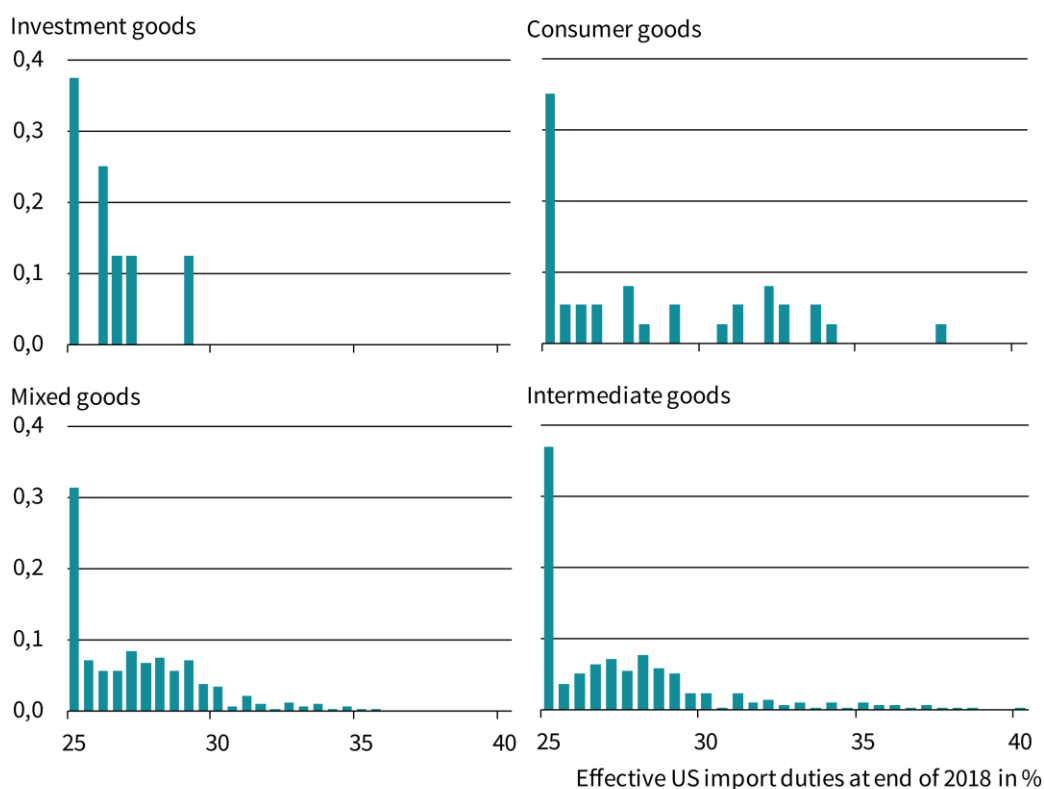
Tariffs

The welfare loss depends crucially on the tariff and the quantity adjustment. In Figure 2 we show the distribution of the effective tariff burden on Chinese export goods after a 25 percentage point increase. We consider 702 HS92 4-digit product categories, which have been divided into four broad categories: consumption goods, capital goods, intermediate inputs and mixed goods that cannot be clearly classified.

As some goods were already subject to some tariffs before the recent additions, the average effective tariff at the end of 2018 will be 27.4%. Without the additional Trump tariffs, the average tariffs would be 2.4% and the 25 percentage point increase is thus economically significant. Two hundred and two out of the 702 product categories had no tariff at all until the recent levies; these were primarily consumption goods and intermediate inputs.

Figure 2:

Distribution of the effective US import tariffs
After a tariff increase of 25 percentage points per upper category

Note: This figure displays shares; the combined height of the bars adds up to one.
In total 702 HS92 4-digit product groups were considered. For illustration we only show products with an effective
import tariff below 40%.   © ifo Institute
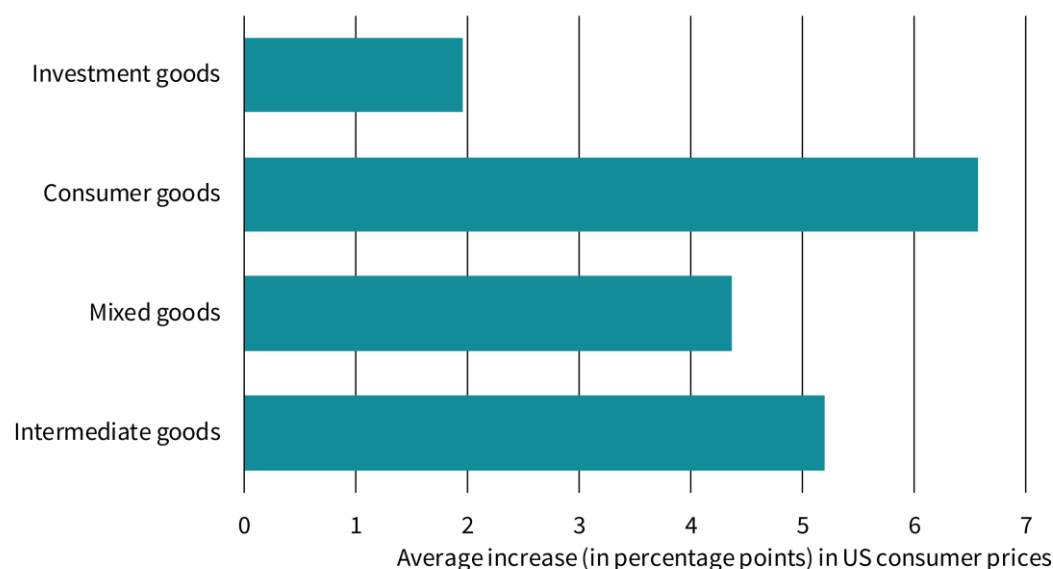
Price Adjustments

The US import tariffs will lead to an increase in US consumer prices based on the relative price elasticities. We use the import and export elasticities estimated by Kee, Nicita, and Olarreaga (2008) and Broda, Limão, and Weinstein (2008) to compute the tariff incidence after a 25-percentage-point increase.[1]

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[1] We use the standard formula for the tariff incidence: $\epsilon_N/(\epsilon_A - \epsilon_N)$, where ϵ_N is the import elasticity and ϵ_A is the export elasticity.

Figure 3:

Average consumer price increase in percentage points for US consumers /firms
After an increase in US import tariffs by 25 percentage points; 702 HS92 4-digit product categories

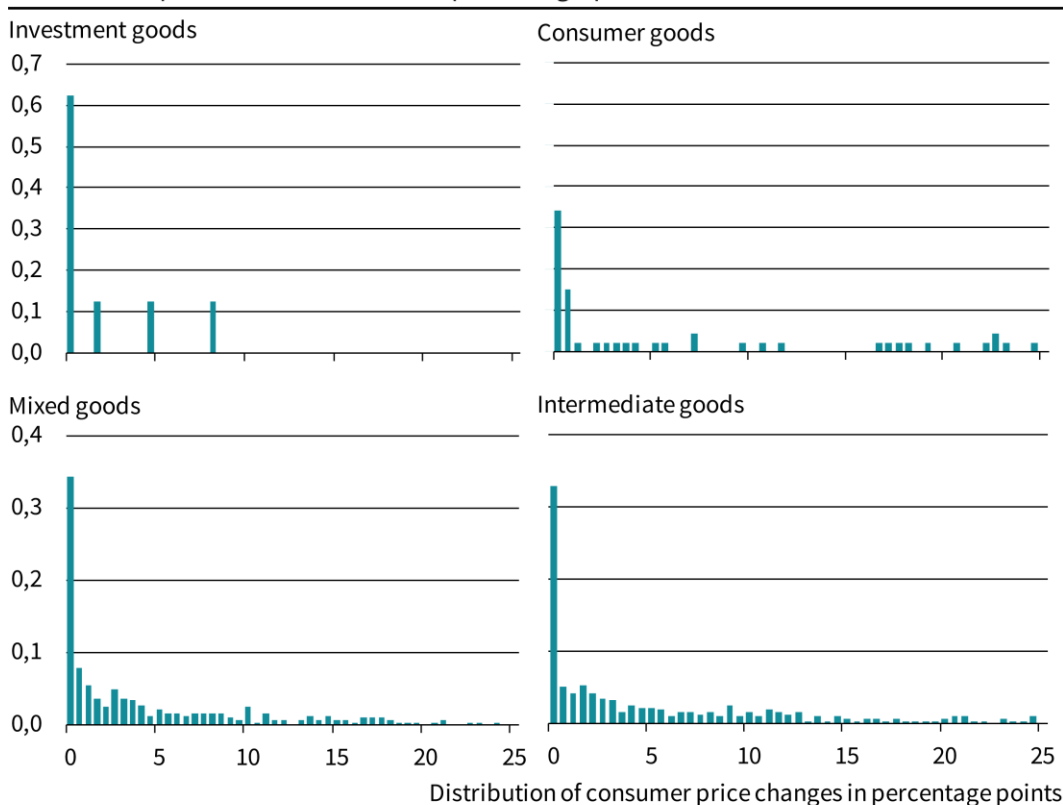Source: Authors' calculations

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Figure 3 shows the expected average increase in US consumer and firm prices for 702 Chinese products categories (HS92 4-digits) split into four broad categories. As the distribution of effective tariffs in Figure 2 already suggested, consumer goods are the most heavily impacted. Their prices rise by 6.5 percentage points on average. The prices of intermediate inputs increase by 5.2 percentage points, while capital goods only become 2 percentage points more expensive. On average, the US prices of affected Chinese goods rise by 4.5 percentage points.[1] In Figure 4 we show the distribution of US consumer price increases. While for most products the increases are only modest, some consumer good and intermediate input categories are hit hard, with price increases of over 20 percent in some cases. Low-income US households in particular will be affected by this increase, as they spend a considerable share of their income on (cheap) Chinese imports - see Zoller-Rydzek (2018). This will lead to a stronger decline in real income for US low income households.

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[1] If we use the import-volume-weighted average, the consumer price increases by 4.64 percentage points.

Figure 4:

Distribution of US consumer prices
After a US import tariff increase of 25 percentage points

Note: The figure presents shares; the combined height of the bars adds up to one in each diagram
HS94 4-digit product categories.
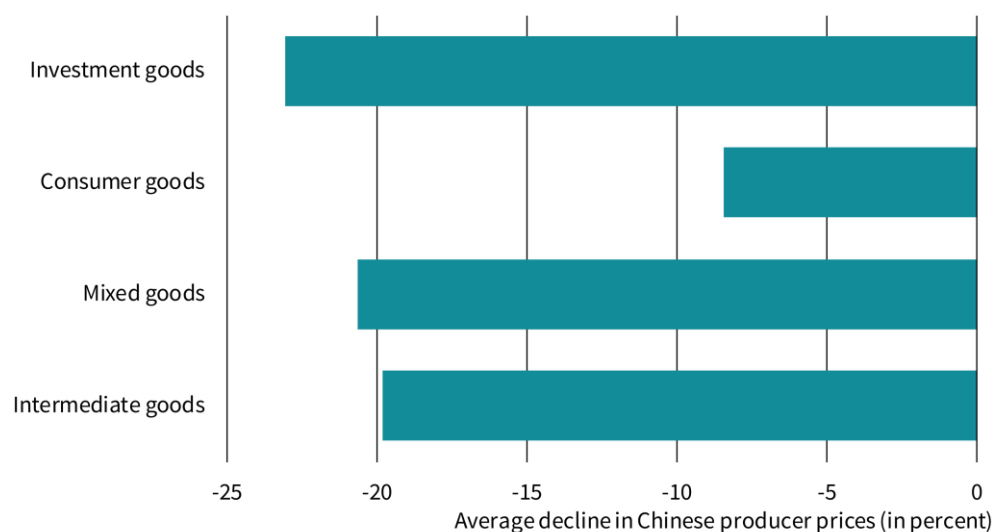Source: Authors' calculations.

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Figures 5 and 6 show the producer price change for Chinese exporting firms affected by the tariffs. Clearly, products were selected to shift most of the tariff burden onto Chinese firms. On average, the producer price declines by over 20 percentage points. Such a significant reduction may cause many Chinese firms to withdraw from the US market.[1]

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[1] US multinationals producing intermediate inputs and consumer goods for the US market will be strongly negatively affected by a significant increase in US import tariffs. Their high initial investment in Chinese production sites makes it very costly to adjust their supply chains and the profits of US multinational firms may drop as a result.

Figure 5:

Average reduction of Chinese producer prices (in percentage points)
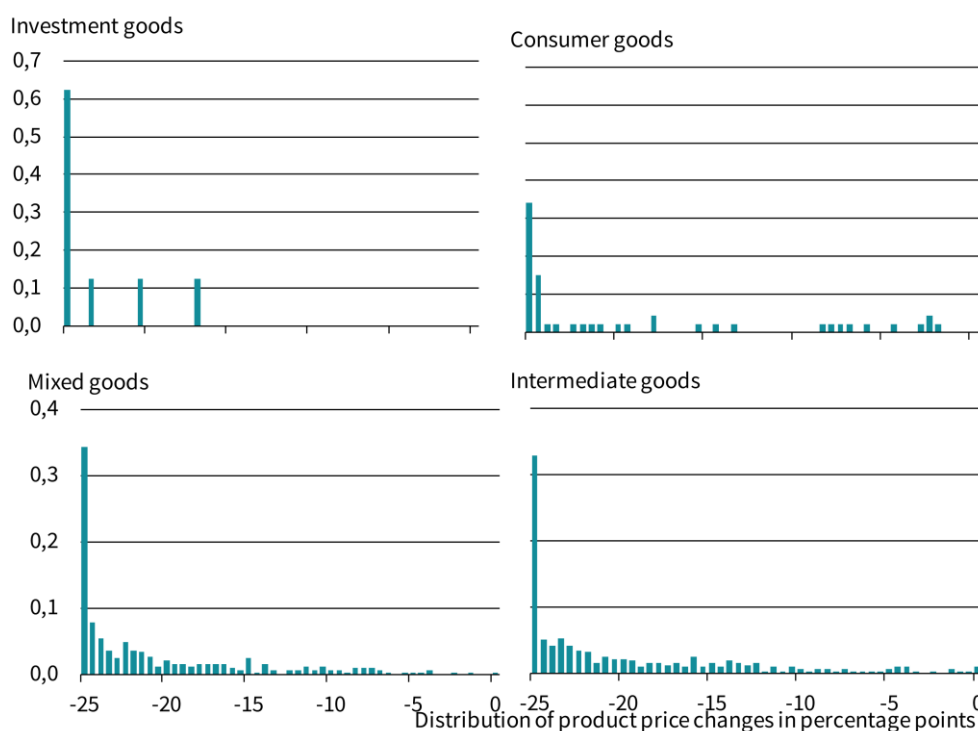After a 25-percentage-point increase in US tariffs; HS92 4-digit products

Average decline in Chinese producer prices (in percent)

Source: Authors' calculations.   © ifo Institute

Figure 6:

Distribution of Chinese producer prices after a US import tariff increase of 25 percentage points
Four product groups, share (density) of HS92 4-digit products

Distribution of product price changes in percentage points

Note: The combined height of the bars adds up to one in each diagram.
Source: Authors' calculations.   © ifo Institute
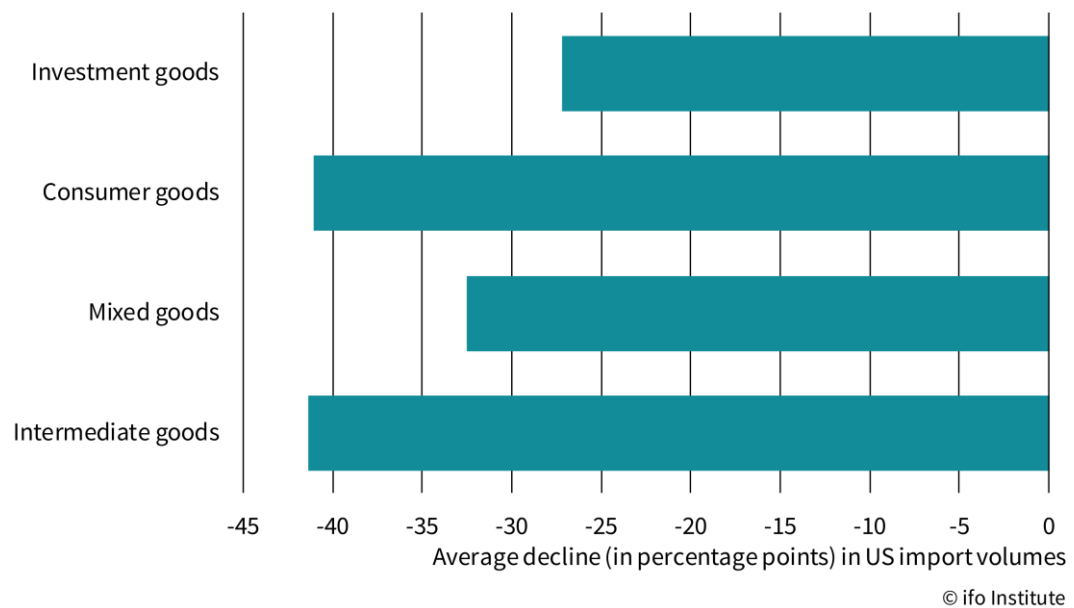
Trade Balance

It is not only consumer and producer prices that will adjust in a response to altered tariffs; import volumes will also change, and both will lead to a reduction in the bilateral trade balance between the US and China. Figure 7 shows the average decrease in US import volumes from China due to the tariffs introduced by President Trump. Imports of intermediate inputs and consumer goods will decline by over 40%. In total, the imports of affected products from China will decrease by 37%. This downturn can attributed in equal measure to the decline in producer prices and the reduction of import quantities.

Figure 7:

Average decline (in percent) of US import volumes from China
After a 25- percentage-point increase in tariffs. Based on 702 HS92 4-digit products

Average decline (in percentage points) in US import volumes

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In 2017, the US had a trade deficit with China of roughly USD 375 billion. Even if we assume that exchange rates will not adjust, that China will not implement any retaliatory duties, and that all demand side effects from third countries are constant, a 25-percentage-point increase in US import duties will only decrease the trade deficit by a mere USD 63 billion to USD 312 billion. While this is a significant decrease, it is far removed from President Trump's goal of a positive trade balance with China.

Tariff Revenues and Welfare Effects

We compute the total economic effect of import tariffs as the sum of the red and green areas in Figure 1. This can be interpreted as the monetary value that Chinese firms and US consumers would be willing to (jointly) pay to avoid these tariffs. The aggregated welfare losses in China and the US are around USD 1.6 billion. Only about one third, or USD 522 million, of these losses are sustained by US consumers (green triangle in Figure 1), while the remainder falls to Chinese exporting firms. To evaluate the total welfare effects for US consumers and firms, we have to consider potential tariff revenues. Most of the tariff incidence falls on Chinese firms. It is their declining profit margins that would pay for a large share of the tariffs, i.e. the red rectangle in Figure 1. These tariff revenues can be used to compensate for the welfare losses of US consumers. In total, the tariff revenues of the tariffs introduced by President Trump amount to USD 22.5 billion, of which USD 18.9 billion are to be paid by Chinese firms. This implies net welfare gains of USD 18.4 billion for US consumers.

Final Remarks

Through its strategic choice of Chinese products, the US government was not only able to minimize the negative effects on US consumers and firms, but also to create substantial net welfare gains in the US. The US government implemented an optimal tariff strategy as discussed by Irwin (1996). As the trade conflict escalates, however, the US administration may not be able to restrict its selection to products with high import elasticities; and US welfare might decrease as more of the tariff incidence falls on US consumers. Moreover, China's next countervailing duties will be chosen in a similar way, namely in a bid to shift the tariff burden onto US exporters.

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