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# Trade and trade diversion effects of United States tariffs on China

## Abstract

Since mid-2018 the United States of America and China have been locked in a trade confrontation which has resulted in several rounds of retaliatory tariffs. This paper investigates the impact the United States tariffs on China on United States imports. This paper finds that United States tariffs against China have resulted in a reduction in imports of the tariffed products by more than 25 percent. The analysis finds that China's export losses in the United States have resulted in trade diversion effects to the advantage of Taiwan Province of China, Mexico, the European Union and Viet Nam among others. The analysis also finds that those effects have increased over time. The analysis finds some preliminary evidence that Chinese exporters may have started to bear part of the costs of the tariffs in the form of lower export prices. Overall, the results indicate that the United States tariffs on China are economically hurting both countries. United States losses are largely related to the higher prices for consumers, while China's losses are related to significant export losses.

**Key words:** Trade War, Trade Diversion, Tariffs

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## Acknowledgements

# 1. Introduction

Over the course of 2018, the United States administration started implementing a series of trade measures aimed to curtail imports, first targeting specific products (steel, aluminum, solar panels and washing machines) and then specifically targeting imports from China.[1] The first phase of the United States-China trade confrontation occurred in the early summer of 2018 when the United States and China raised tariffs on about US$ 50 billion of each other's goods. The impossibility of finding common ground to resolve the issues of trade balances and intellectual property rights resulted in the further deterioration of United States-China trade relationship. The United States administration introduced additional tariffs in September 2018 to cover US$ 200 billion of Chinese imports, to which China retaliated by imposing tariffs on imports from the United States worth an additional US$ 60 billion. While these tariffs were initially due to rise from 10 to 25 percent in January 2019, in early December 2018 the parties agreed to hold off any retaliatory actions until March 2019. This truce held until June 2019 when the United States went ahead with the planned increase in tariffs from 10 percent to 25 percent, to which China responded by raising the tariffs on a subset of the products which were already subject to tariffs. The retaliation further escalated in September 2019 when the United States imposed 15 percent tariffs on a large subset of the remaining US$ 300 billion of imports from China not yet subject to tariffs. Further escalation is expected to take place in December 2019. This series of events and retaliatory actions is known as the United States-China trade war.

The sudden change in United States trade policy vis-à-vis China during the second half of 2018 provides an opportunity to investigate the impact of tariff changes on international trade. The fact that tariffs were implemented in different phases, on a single country, and on very specific products allows us to discern their effects using conventional and well tested methods. This paper uses updated and finely disaggregated data to investigate the impact of such tariffs on United States imports and to answer three related questions: first, to what extent and when United States tariffs have reduced imports from China; second, whether United States tariffs have had any effect on China export prices; and third, to what extent United States tariffs on China have resulted in a surge of United States imports from elsewhere. This paper analyzes the impact of the two initial phases of the United States-China trade war. Phase one covers the products for which United States tariffs were initially raised in July 2018. Phase two covers the products for which United States tariffs were initially raised at the end of September 2018. Phase one of United States tariff escalation involves about US$ 60 billion worth of imports from China, comprising about 1,100 HS 8-digit codes. Phase two of United States tariffs on China covers about US$ 200 billion worth of imports from China, comprising about 6,000 HS 8-digit codes. The United States tariff schedule comprises close to 11,000 HS8 tariff codes, thus phase one and two collectively cover about two thirds of United States HS8 lines[2].

The analysis of this paper finds that the additional United States tariffs against China have resulted in a reduction in imports of the tariffed products by more than 25 percent during the first half of 2019. Importantly, the analysis indicates that China's export losses have increased over time, with losses in the second quarter of 2019 relatively higher than in previous quarters. Regarding prices, the analysis finds some indications that Chinese exporters may have started in the second quarter of 2019 to bear part of the costs of the tariffs in the form of lower export prices. The analysis also finds that China's export losses in the United States market have resulted in trade diversion effects, but only partially so. United States imports from Taiwan Province of China, Mexico, the European Union and Viet Nam among others, have all substantially increased because of the United States tariffs on China. At the sectoral level, office machinery and communication equipment were the sectors most affected by the tariffs.

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[1] Bown (2019) provides a clear summary and a detailed timeline of the United States- China trade war.

[2] Because trade data is not yet available, the analysis of this paper does not cover the last phase of the trade war: the products for which tariffs were raised in September 2019. Moreover, this paper focuses only on the impact of United States tariff escalation on United States imports because the sufficiently disaggregated data on the Chinese imports that is required for the analysis is not yet publicly available. The methods of this paper can be used to infer the impact of the trade war on Chinese imports once the data become available.

This paper continues as follows. Section 2 provides a brief overview on the general effects of tariffs on international trade. Section 3 describes recent statistics on United States imports. Section 4 provides econometric evidence on the impact of tariffs on United States imports, import prices, and trade diversion. Section 5 presents trade diversion effects by country. Section 6 concludes.

# 2. Tariffs and international trade

Conventional trade models provide a framework for understanding the impact of tariffs on trade: tariffs raise the prices of foreign goods with the result of reducing demand for imports.[3] Moreover, in the case of tariffs applied only to specific countries, as in the United States-China trade war, tariffs can lead to trade diversion effects as importers can avoid the tariffs by sourcing the goods from elsewhere. Trade diversion effects do not necessarily happen, and generally are not complete, meaning that third countries are generally able to capture only part of the trade, with the rest being lost or internalized by the country imposing the tariff.

There are various reasons for which trade diversion effects are generally not complete. For example, other countries may not have enough untapped supply capacity, exporters subject to tariffs may retain trade by reducing their prices; and trade frictions may make it very difficult to find other competitive suppliers, such as high transportation costs due to inadequate trade infrastructures. In practice, the various effects of tariffs are not mutually exclusive and often happen in concert:  bilateral tariffs lead to higher prices for consumers, to lower profits for exporting firms, and are accompanied by trade diversion effects that favour third countries. Trade models capture these effects with parameters measuring the degree to which prices and quantities imported from different countries react to tariffs.

While trade models provide a framework for understanding the dynamics of the ongoing trade war, data is required to validate the models. The United States Census Bureau provides very comprehensive and updated official statistics which can be used to provide some insights on the effects to date of United States tariffs on imports from China. [4]

To investigate the effect of United States tariffs on China this paper uses trade data at the 8-digit level of the HS classification, representing more than 10,000 tariff lines. The analysis makes use of data from the first quarter of 2017 to the second quarter of 2019. The use of quarterly data reduces the noise and improves accuracy over monthly level data. The data utilized for this study is comprised of import values and prices (computed from unit values by dividing values by quantities). Unit values are to be intended as export prices as they do not include any tariffs imposed by the United States.[5]

# 3. Descriptive statistics

Before formally examining the impact of United States tariffs on imports from China it is useful to provide some descriptive statistics to put the subsequent analysis in context. In 2018, United States imported from China

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[3] Amiti, Redding and Weinstein (2019) provide a more exhaustive discussion how tariffs affect demand and prices in the context of the United States-China trade war. Amiti, Itskhoki, and Konings (2019) more formally discuss the mechanisms through which international shocks affect domestic prices.

[4] The long-term effects of bilateral tariffs on international trade are more complex. Trade flows depend not only on supply, demand, and substitution effects but also on reliable infrastructure and logistics. While the effect of tariffs on prices and imports may be immediate, their effect will only gradually converge towards a new equilibrium. Firms need to enter new markets, production processes need to be shifted, and logistic infrastructure needs to be built.

[5] It is important to emphasized that the available data on import prices is generally less reliable and does not account for quality or varieties of goods within the same tariff line (e.g. standard LED monitors vs Ultra HD monitors), so the comparison of import prices across time is often more problematic as it would need to assume away changes in quality and varieties. For this reason, the unit values data in the analysis is accurately screened for outliers.

about US$ 550 billion worth of goods, US$ 255 billion of which in the first half of 2018. By comparison, the value of United States imports from China in the first half of 2019 was less than US$ 230 billion, corresponding to a decline of about 10 percent. A key question is therefore to what extent the United States-China tariffs contributed to such a decline.

Preliminary evidence of the impact of tariffs on United States imports from China can be drawn by comparing the changes in the values of goods imported from China subject to United States tariffs vis-à-vis those not affected. Figure 1 presents percentage changes in United States imports from China in 2019 vs the same quarter of 2018 to control for seasonal patterns. Figure 1 further differentiates between goods which were subject to phase one tariffs and those of subject to phase two.

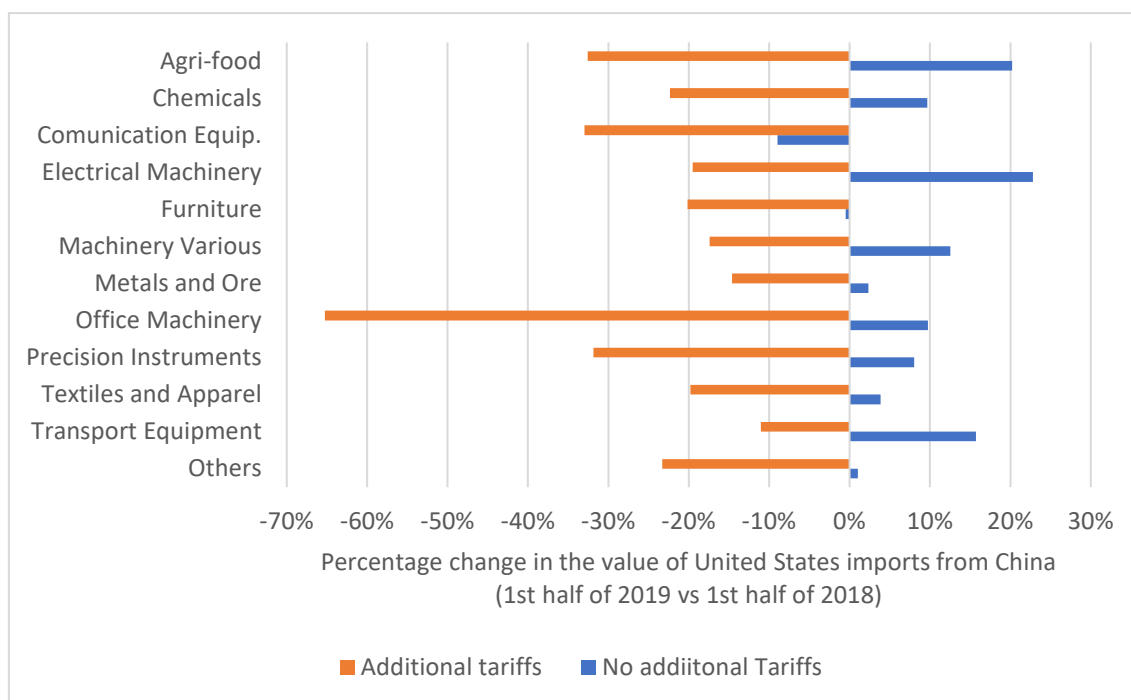**Figure 1. Percentage changes in the value of United States imports from China**
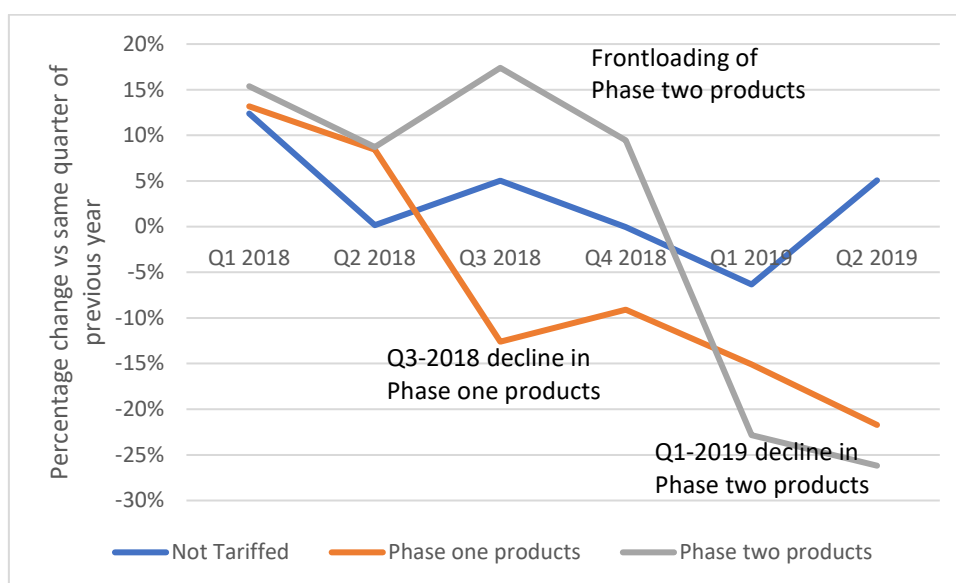


*Source:* Author's calculation based on United States Census Bureau data.

Figure 1 indicates that Chinese exports to the United States started to decline soon after the imposition of tariffs, especially for those products covered under phase one. For the products covered under phase two the effects started to be evident from the first quarter of 2019. Figure 1 also shows some frontloading regarding goods under phase two (i.e. the increase in imports just before the tariffs take effect). By comparison, imports of goods not subject to tariffs have been relatively more stable and increased during Q2 2019. One possible reason for such an increase is United States importers stockpiling due to the possibility of additional tariffs on the remaining products (which indeed happened in September 2019). Another possible explanation is that Chinese exporters were trying to maintain profit margins by increasing exports in non-tariffed goods. Another possibility relates to mis-invoicing products to avoid the tariffs (Buehn and Eichler, 2011).

The overall effect of United States tariffs on imports from China is also evident by disaggregating the data by economic sectors. Figure 2 reports the change in the value of imports between the first half of 2018 vs the first half of 2019 across sectors. In most of the sectors, imports declined in the case of tariffed products (those under phase one and two combined), while imports increased for those products not subject to tariffs. The exception is lower imports for communication equipment not subject to additional tariffs, but even so imports fell to a relatively lower extent (in percentage terms the value of non-tariffed goods dropped by about 10 percent vs a drop of about 30 percent for tariffed goods).[6]

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[6] This could be the results from the United States-China highly integrated value chains in the ICT sectors.

Figure 2. Percentage change in United States imports from China in tariffed and non-tariffed products, by sector

*Source:* Author's calculation based on United States Census Bureau data.

Office machinery has been the hardest hit sector in the trade war. In this category, the imports of products subject to additional tariffs dropped by 65 percent. For other sectors, such as agri-food, communication equipment, and precision instruments, trade in the tariffed goods fell by more than 30 percent. Although the descriptive statistics of Figures 1 and 2 suggest considerable effects of United States tariffs on imports from China, there could also be other factors confounding the results. The next section provides more formal evidence of the impact of tariffs on United States imports.

# 4. Assessing the impact of United States tariffs on imports from China, on United States import prices and on United States imports from other countries

This section more formally examines whether the general predictions of trade models are reflected in the data. The analysis specifically examines three related questions: first, to what extent United States tariffs have reduced imports from China, and when; second, whether United States tariffs have had any effect on United States import prices; and third, to what extent tariffs have resulted in a surge of United States imports from third countries.

The identification strategy relies on simple methods: the change in the variable of interest is regressed on a dichotomous variable indicating the presence of additional tariffs. Such approach identifies the impact of tariffs by comparing the imports of tariffed goods with that of products not affected by tariffs. The econometric estimation provides a more robust analysis than simple descriptive statistics as it further controls for demand effects and sectoral specific shifts. The analysis is based on a set of regressions where the percentage change

in the variable of interest in a given quarter (measured on a year to year basis). The econometric setup therefore consists of cross-section regressions where the identification is between tariffed and non-tariffed products. In formal terms:

$$\Delta X_k = \beta^1 + \beta^2 \Delta C_k + \beta^3 T_k^1 + \beta^4 T_k^2 + \phi_z + \varepsilon_k \qquad (1)$$

In this specification $\Delta X_k$ is the percentage change of the variable of interest, either the value of trade in US dollars or the price (unit value), for product $k$ at the 8-digit level of disaggregation, and $\Delta C_k$ controls for changes in the variable of interest in relation to the rest of the world (ROW). $T_k^1$ and $T_k^2$ are dichotomous variables indicating whether product $k$ was subject to tariffs in phase one or phase two. The term $\phi_z$ denotes sectoral fixed effects (HS 4-digit) and $\varepsilon_k$ is the error term. Standard errors are clustered at the HS 4-digit level. Equation 1 is estimated separately for the six quarters from Q1 2018 to Q2 2019. Values and prices are constructed as percentage change vis a vis the same quarter of the previous year to control for seasonal patterns. The presence of HS 4-digit fixed effects is essential in providing evidence as it restricts the identification within similar products.

In equation (1) the coefficients $\beta^3$ and $\beta^4$ measure the average impact of tariffs, in phase one and phase two. For example, a coefficient of minus 0.1 would imply that on average the value of goods subject to tariffs have declined by 10 percent relative to the value of similar goods not subject to tariffs. In this setup, the constant measures the changes in the variable of interest for goods not subject to tariffs. Note that by running a series of cross-section regression it is possible to better identify the timing for the tariffs to have an impact on the variable of interest.

## Table 1. Impact of United States tariffs on imports from China

|  | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
|  | Q1 2018 | Q2 2018 | Q3 2018 | Q4 2018 | Q1 2019 | Q2 2019 |
| Percentage change in imports from the | -0.00051 | -0.00506*** | -0.00187 | 0.001000 | -0.00161 | -0.00116 |
| ROW | (0.0004) | (0.0019) | (0.0013) | (0.0006) | (0.0014) | (0.001) |
| Phase 1 tariffs | 0.0204 | 0.0505 | -0.220*** | -0.392*** | -0.374*** | -0.491*** |
|  | (0.0408) | (0.0396) | (0.0383) | (0.0429) | (0.0393) | (0.0390) |
| Phase 2 tariffs | 0.00546 | 0.0620** | 0.0169 | -0.0337 | -0.203*** | -0.293*** |
|  | (0.0315) | (0.0303) | (0.0292) | (0.0339) | (0.0307) | (0.0305) |
| Constant | -0.00999 | -0.0873*** | 0.0584*** | 0.0396* | -0.0255 | 0.0425** |
|  | (0.0213) | (0.0205) | (0.0201) | (0.0229) | (0.0212) | (0.0213) |
| Observations | 6,012 | 6,224 | 5,890 | 6,059 | 6,327 | 6,351 |
| R-squared | 0.224 | 0.219 | 0.215 | 0.259 | 0.253 | 0.274 |

*Note:* The dependent variable is the percentage change in United States imports from China. All specifications include HS 4-digit fixed effects. Top and bottom 1 percent of observations are dropped. Clustered standard errors are shown in parenthesis, *** p<0.01, ** p<0.05, * <0.1.

Table 1 reports the results of the estimation on the percentage change in the value of United States imports from China across six quarters. The results of Table 1 indicate that tariffs started to significantly affect United States imports from China in Q3 2018 for the products under phase one, and in Q1 2019 for products under phase two. Also note that the average impact of tariffs on United States imports from China appear to increase over time. For example, while the differential impact in the value of goods subject to phase one tariffs versus

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these not affected was about 22 percent, it increased to about 45 percent in Q2 2019.[7] For products subject to phase two it increased from 20 in Q1 2019 to 25 percent in Q2 2019. Also note that there was no systematic difference across product groups before tariffs took effect in Q3 2018. This provides further evidence that tariffs have been the main factor behind the fall in United States imports from China.

The second question of interest is how much of the tariffs are reflected in consumers' prices or whether the tariffs lower export prices. While the established literature (Feenstra, 1989; Goldberg and Knetter, 1997; Broda, Limao and Weinstein, 2008) generally finds that both consumers and exporters prices are affected by the imposition of tariffs, the few studies examining this question in relation to the United States-China trade war have so far found an almost full pass-through of tariffs to United States consumers' prices, with very little change in Chinese export prices (Amiti, Redding and Weinstein, 2019; Fajgelbaum, Goldberg, Kennedy and Khandelwal, 2019). However, there are reasons for which the tariffs pass-through to prices may initially be complete but then become incomplete over time. Notably, import prices may be sticky due to long contractual terms. In the medium-term, exporters could counteract the effect of the tariffs by lowering their prices to preserve market share. Preservation of market share is a good strategy when increases in trade costs are perceived as temporary, as it will deter foreign competitors from contesting the markets (Froot and Klemperer, 1986).

As with values and market share, the analysis uses differences in the changes of prices between goods subject to tariffs and those not subject to tariffs within the same narrowly defined sector. China's export prices are calculated from United States unit values of the goods originating from China and therefore do not account for costs related to the tariffs.[8] In this setup, a decline in prices would suggest that Chinese exporters were bearing some of cost of the United States tariffs. Table 2 presents the econometric results.

## Table 2. Impact of United States tariffs on China export prices

|  | (1) Q1 2018 | (2) Q2 2018 | (3) Q3 2018 | (4) Q4 2018 | (5) Q1 2019 | (6) Q2 2019 |
|---|---|---|---|---|---|---|
| Percent change in import prices from ROW | 0.0686* | 0.0177 | 0.108* | 0.177*** | 0.162*** | 0.104*** |
|  | (0.0398) | (0.0172) | (0.0614) | (0.0320) | (0.0415) | (0.0359) |
| Phase 1 tariffs | 0.00781 | 0.0472 | 0.0358 | 0.0214 | 0.00772 | -0.0723** |
|  | (0.0269) | (0.0293) | (0.0325) | (0.0326) | (0.0309) | (0.0298) |
| Phase 2 tariffs | 0.0307 | 0.0116 | -0.0212 | -0.0166 | -0.0467 | -0.0877** |
|  | (0.0383) | (0.0386) | (0.0475) | (0.0449) | (0.0456) | (0.0374) |
| Constant | -0.0138 | -0.0160 | -0.0153 | -0.0342 | -0.0324 | -0.00155 |